Fault analysis and repairs NEC Tachographs/ EC Tachographs 1318

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Automotive

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Section 1 General notes

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Key

- \- not available
- o optional
- • illustration available
- * additional equipment "01" only
- ** discontinued

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1 General notes

1.1 History - 1318

Year	Remarks	Device number
1984	KTCO 1318 introduction • 1st pilot lot • 2nd pilot lot • Series (Asic boards)	 from 10.000 to 10.000 from 13.000
1985	From September with optical data output	from 20.000
1991	October: KTCO 1318 (EMC) introduced	from 582.000
1994	From December: µP units introduced • Delivery to Mercedes Benz • New mounts, various front panels • Start: 05.94 (units with self-test function) • Final: 01.01.96 (law comes into force)	from 1.500.000
1995	µP units, ADR version • New barrier unit (current limiter) "STB 3"	

1.2 Preparing repairs

✓ Voraussetzung

Prior to any repair:

- Check recordings on tachograph chart.
- Visually check all mechanical parts.
- Visually check all electrical cables and components.
- Check soldering points and conductors.
- Check gear engagement.
- Check that gears are running smoothly.

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1.3 Repair hints

Bemerkung

- Item numbers shown in the illustrations do not represent order numbers
- For order numbers please refer to the Electronic Product Catalogue (EPC)
- Any repair work on units up to manufacturing number 9.999 will be carried out at head office in Villingen. Complete units must be sent in for repair.

Lubrication When carrying out any repair work, lubricate the relevant parts in accordance with Section 8.

Electrical connections For details on wiring diagrams please refer to Section 7.

Plug connections Only remove mini-timer terminals and Ultrex connectors from the socket housing using the special tool designed for this purpose. Make sure that connectors are plugged in correctly and provide secure contact. Please refer to Section 3 for a workflow description.

Soldered connections Switch off the power to NEC / EC Tachographs before you carry out any soldering work. Carry out all soldering work with an electrically controlled, earthed soldering unit and the necessary expertise.

Bemerkung

With soldering you must ensure the following:

- The soldering tip must be no more than 0.5 mm.
- Do not produce any cold soldering points.
- Avoid any short circuits between the individual soldering points.
- Remove any soldering spatters.

Cabling Run all cables without clamping and crushing them. The cables must not cause any malfunctions in moving parts.

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1.4 Workbench setup

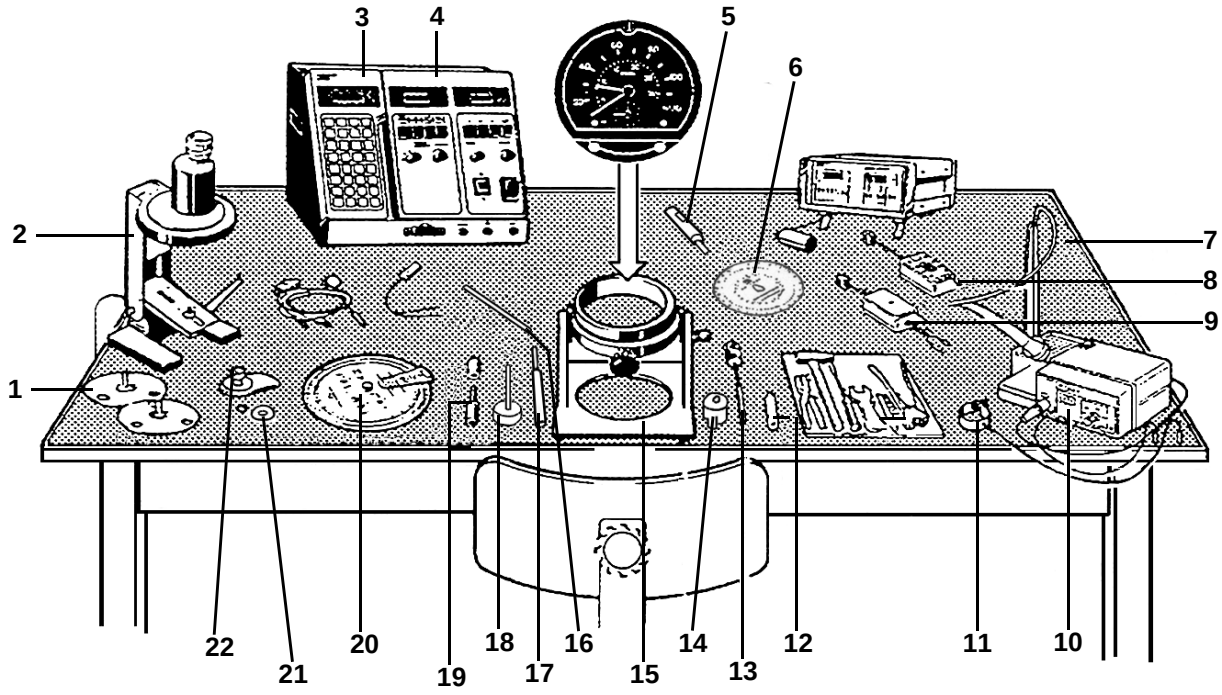

Fig. 1-1 Workbench design

1 Tachograph chart turntable
2 Tachograph chart analyser incl. measuring microscope
3 STC (incl. accessories)
4 BTC I
5 Rivet holder
6 Adjustment disc
7 Conducting, earthed cover
8 Test adapter 1318
9 Test adapter for 1318; STB barrier unit (no µP)
10 Electronically controlled, earthed soldering unit
11 Earthed wrist band
12 Bolt
13 Indicator extractor
14 Support for speed indicator shaft
15 Tachograph mount
16 Stylus adjustment tool
17 Riveting die
18 Drilling support for tubular rivet
19 Hood removal and fitting tool
20 Analysing chart
21 Clamping plate (complete) for 7 day adjustment disc
22 Test template

✓ Voraussetzung

Please ensure when setting up the workbench that you heed the CMOS anti-static protective measures:

- ✓ Conducting, earthed cover (7)
- ✓ Earthed wrist band (11)
- ✓ Electronically controlled, earthed soldering unit (10)

Please refer to page 1-6 for a detailed view of the auxiliary tools.

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1.5 Auxiliary tools – detailed view

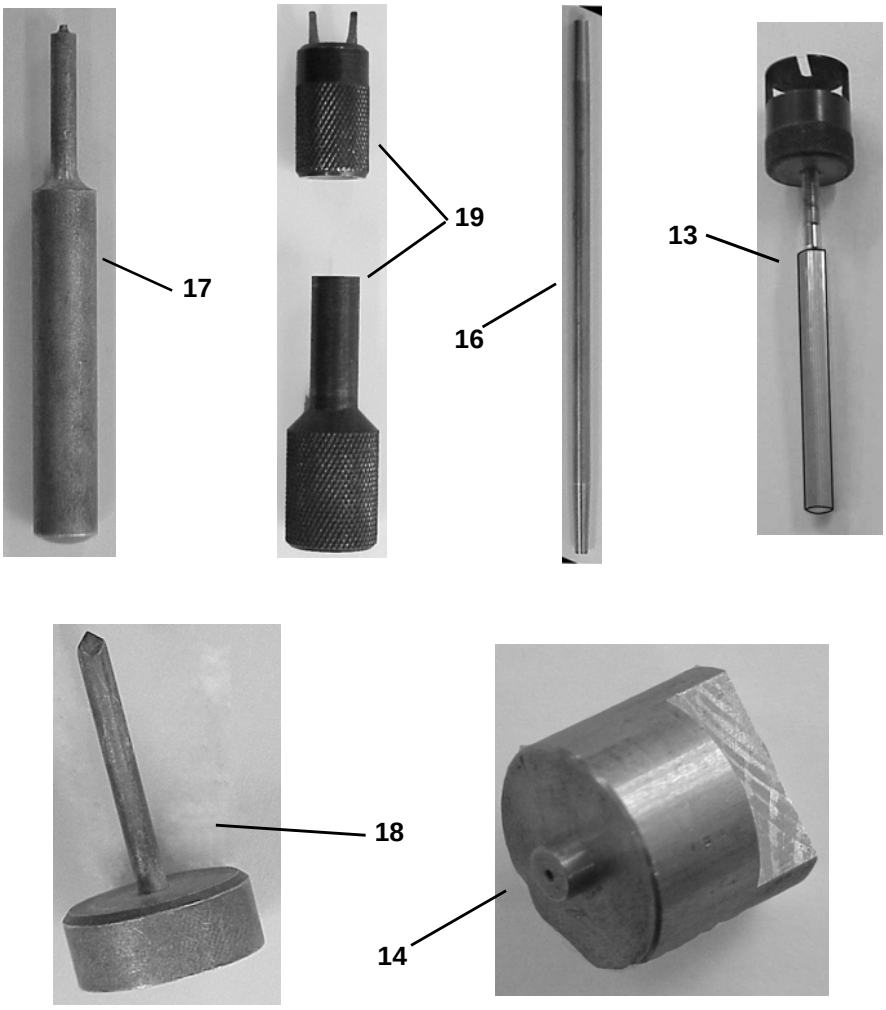

Fig. 1-2 Auxiliary tools

13 Pointer extractor
14 Support for speed pointer shaft
16 Stylus adjustment tool
17 Riveting die
18 Drilling support for tubular rivet
19 Hood fitting tool

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Section 2 Removing and fitting housing cover

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2 Contents and assignment

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Key

- \- **not available**
- o **optional**
- * **for units with additional equipment "01" only**

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Key

- \- **not available**
- o **optional**
- * **for units with additional equipment "01" only**

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Key

- \- **not available**
- o **optional**
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key

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Key

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- o **optional**
- * **for units with additional equipment "01" only**

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2.1 Housing cover – overall view

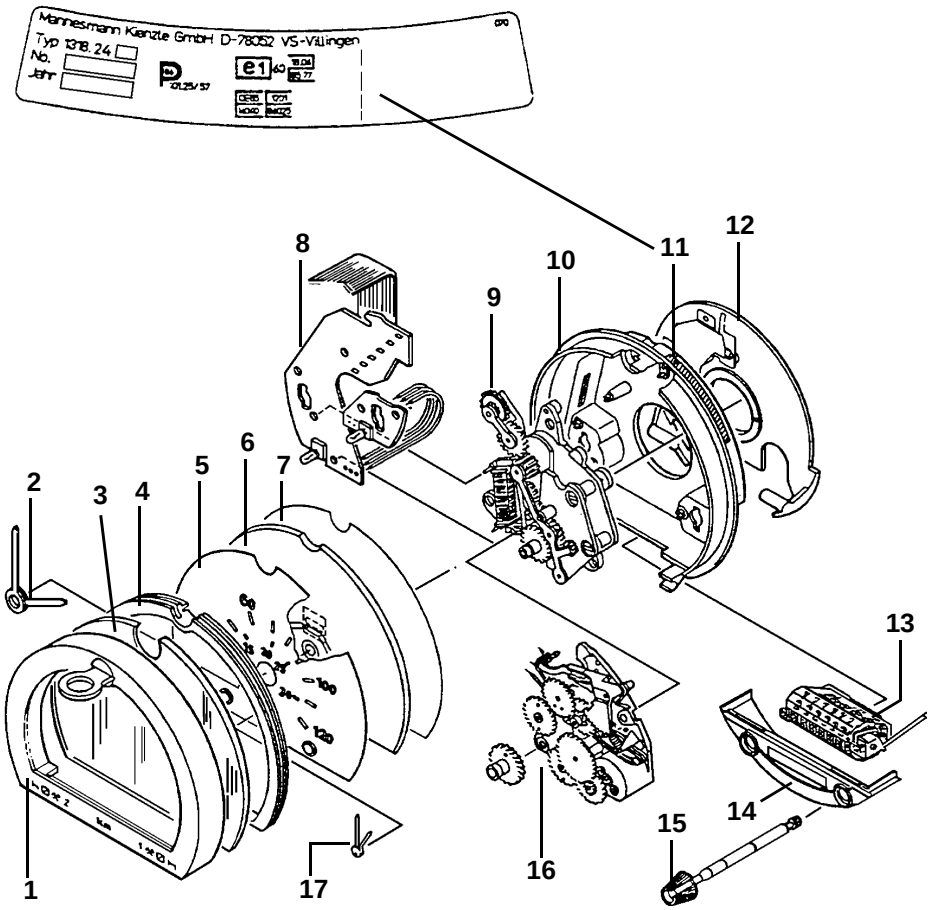

Fig. 2-1 Housing cover – overall view

1	Bezel with lock	**9**	Quartz mechanism with speed shaft
2	Speed/RPM indicator	**10**	Cover
3	Dial glass	**11**	Type plaque
4	Panel	**12**	Separating plate
5	Dial	**13**	Distance counter
6	Dial support	**14**	Cover
7	Reflector	**15**	Knob
8	Cover/lamp plate with flat cable	**16**	n measuring system

! Note

Repair hint:
The steps to be carried out when repairing the 1318.40 tachograph are similar to the ones for the 1318 tachograph. Its main components are constructed in the same way as the EC/NEC; special components are listed in the Electronic Product Catalogue (EPC).

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2.2 Type plaque labelling

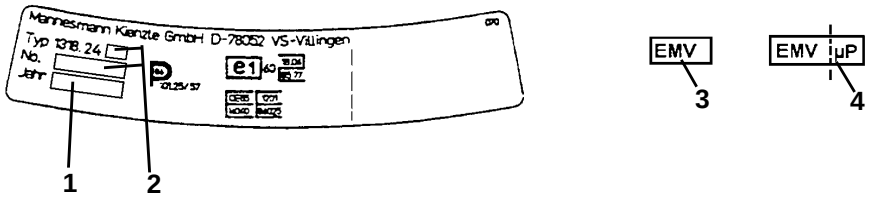

Fig. 2-2 Type plaque labelling

1 Year of manufacture

2 Device/type number

3 1318 without µP electronics

4 1318 with µP electronics

When servicing the unit, complete fields (1), (2) and make a note of labels (3) and (4).

Remark

- From 04.94: black, laser-marked type plaque.
- From 03.95, the numbers 80 to 86 on the type plaque (item 2) identify an ADR/STB version.

Note

Installing µP units – ADR version – without barrier unit into 24 V vehicles is permitted if these are not used for the carriage of hazardous goods.

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2.3 Removing front parts

2.3.1 Removing bezel

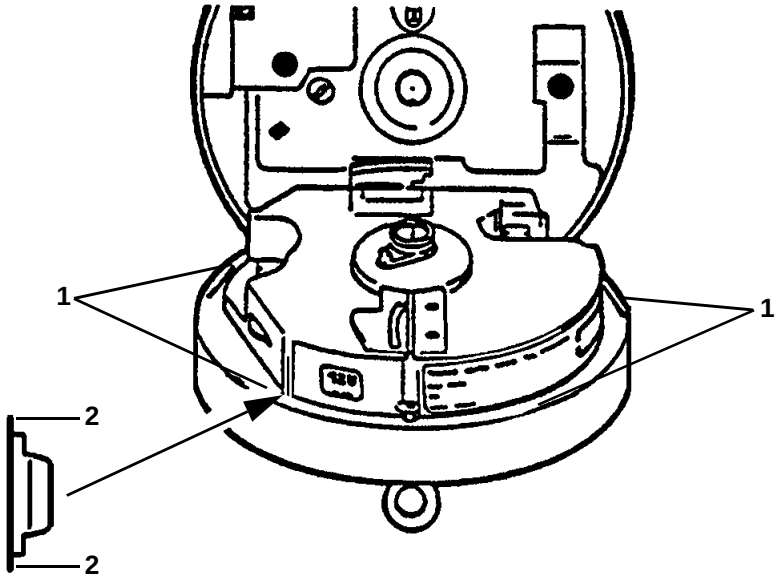

Fig. 2-3 Removing bezel seals

1 Bezel seals **2** Sealing lugs

Procedure

❍ **Press the bezel seals (1) in about 3-5 mm using a watchmaker's screwdriver, max. Ø 1.9 mm.**

When doing this, the sealing lugs (2) will break away.

❍ **Press used seals without sealing lugs (2) into the four sealing points until these are flush with the cover.**

❍ **Close the housing cover and remove the bezel.**

❍ **Remove all bezel seals.**

! Note

Bezel versions:
The 1318 Electronic Product Catalogue lists various versions for different manufacturers.
These are interchangeable.

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2.3.2 Replacing dial glass

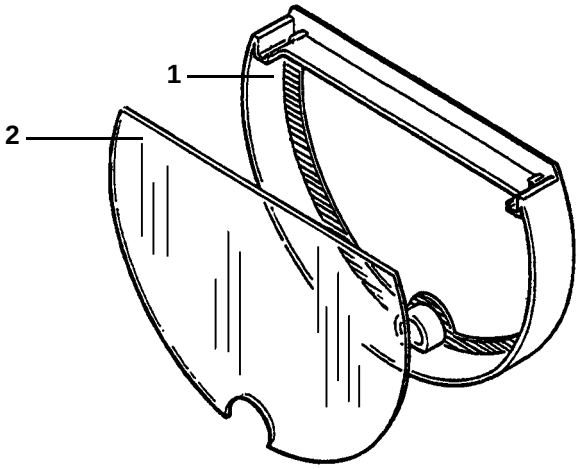

Fig. 2-4 Replacing dial glass

1 Adhesive surface **2** Dial glass

Remark

With unit versions 1318-03, -04, -25, -26 only concave plexiglass must be used. For all other versions and versions 1318.2570 and .2670 silicate glass that is not curved must be used.

- The dial glass must be fitted in such a way that it rests on the bezel completely.
- There must not be any adhesive residue on the glass.

Procedure

- ❍ **Remove the damaged dial glass from the bezel.**
- ❍ **Remove any adhesive residue from the bezel.**
- ❍ **Apply the prescribed adhesive, "Delomet 2301", to the surface (1).**
- ❍ **Insert a new dial glass (2) and press it on firmly.**

Note

Cleaning dial glass:
Cleaning materials must not contain alcohol and affect the antireflection coating.
Use the intensive plastic cleaner supplied by us.
The cleaner is ready for use and can be applied using a soft cloth.

The order number can be found in the 1318 Electronic Product Catalogue.

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2.3.3 Lock cylinder

2.3.3.1 Removing lock cylinder

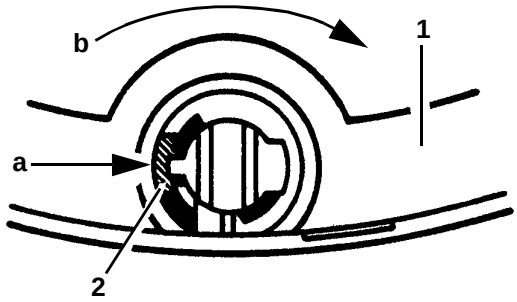

Fig. 2-5 Removing lock cylinder

1 Bezel **2** Tumbler

Procedure

- ❍ **Press the tumbler (2) down so that it points to (a) and turn the key in the direction of the arrow (b) until it reaches the stop.**
- ❍ **Pull the lock cylinder and key out of the bezel (1).**

2.3.3.2 Fitting lock cylinder

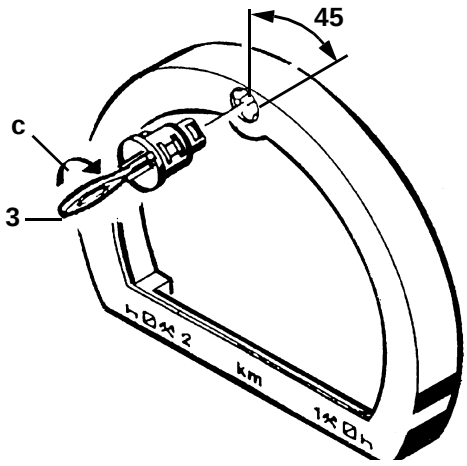

Fig. 2-6 Fitting lock cylinder

3 Key with lock cylinder

Procedure

- ❍ **Insert the lock cylinder and key (3) into the bezel.**

  When doing this, the protruding MS tumbler of the lock cylinder must point to the left bezel edge.

- ❍ **Insert the lock cylinder until it is flush with the bezel, turn the key in the direction of the arrow (c) until the tumbler locks into place.**

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2.3.4 Replacing driver and lock bolt

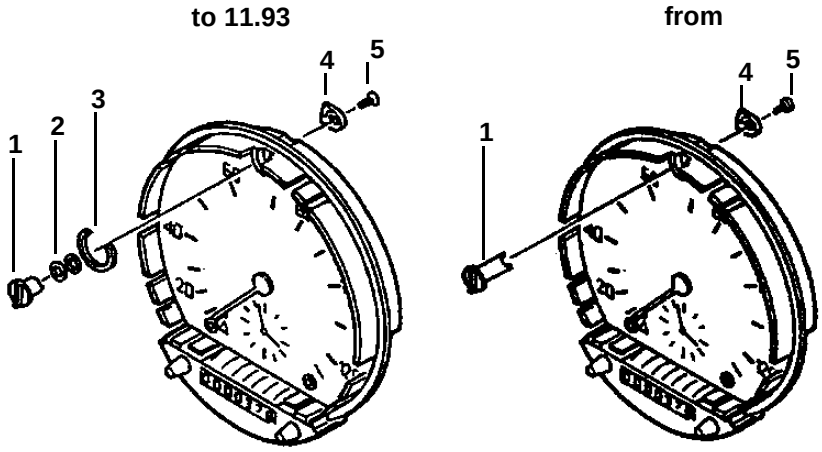

Fig. 2-7 Replacing driver and lock bolt

1 Drive
2 Compensating washers
3 Seal
4 Lock bolt
5 Screw

Remark

When closed, the cover must be flush with the housing and must not have any play.

Procedure

- ❍ **Undo the screw (5).**
- ❍ **Remove the driver (1), compensating washers (2) (until 11.93) and lock bolt (4).**
- ❍ **Replace the self-adhesive seal (3) (until 11.93) if necessary.**
- ❍ **Tighten the compensating washers (2) lightly and put them on the driver (1).**
- ❍ **Put the lock bolt (4) on the driver (1) and fasten the screw.**

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2.4 Modified cover and dial support (from 07.98)

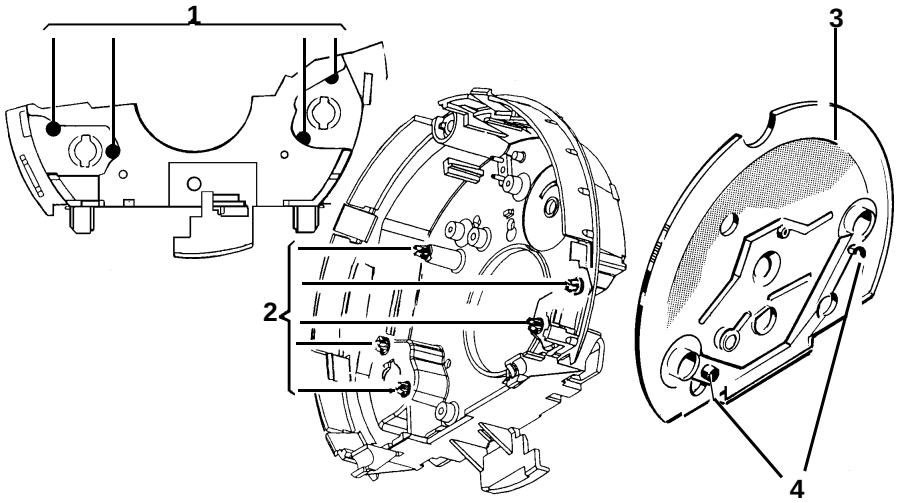

Fig. 2-8 Cover with modified stop bolts and correct dial support

1 Reinforced parts
2 Stop bolts
3 Dial support
4 Hold-down device

Modification

- ☞ Specially designed stop bolts (2) for fitting the cover plate/lamp plate more easily.
- ☞ Hold-down devices (4) fitted on the dial support (3) to ensure that the cover plate/lamp plate stays in place better.

Remark

Fitting a new cover to the reinforced parts (1) during repairs:
Fitting a new cover 1318.0101.010.007 with the correct dial support 1318.0101.016.001 or 1318.0101.065.002

Start of production in July 1998, from device number 2.745.771.
Dial support (3) with hold-down devices (4) is compatible with all cover versions.

Order number

Order number	Previous order number	Description	Remarks
1318.0101.010.007	1318.0101.010.005	Cover	EC and NEC without 1/min, 1318.0101.009.003 1/min, based on 1318.0101.010.007.
1318.0101.016.001	1318.0101.016.000	Dial support	
1318.0101.065.002	1318.0101.065.001	Dial support	for Iveco

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2.5 Removing indicators and dial components

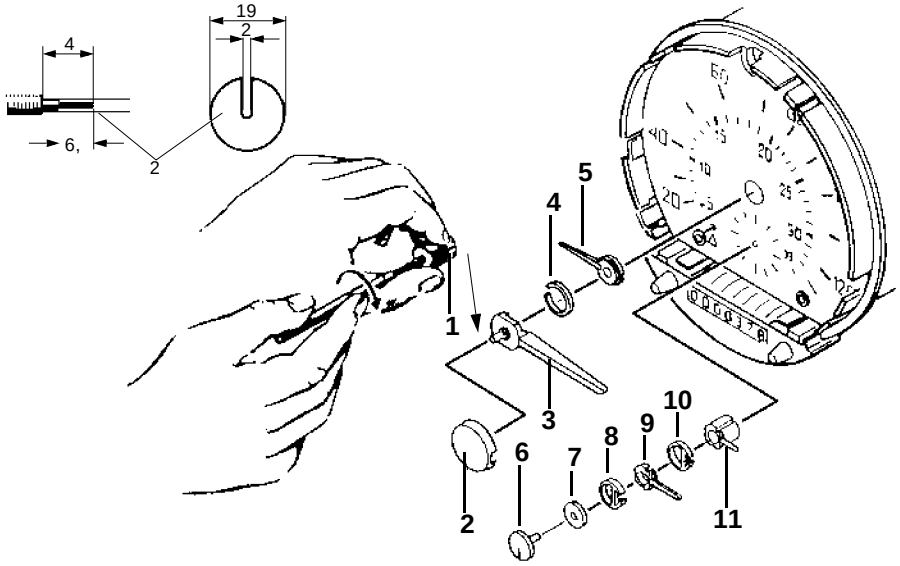

Fig. 2-9 Removing indicators

1 Indicator extractor
2 Cap
3 Speed indicator
4 Ring
5 RPM indicator
6 Second washer
7 Washer
8 Ring *
9 Minute hand *
10 Ring *
11 Hour hand *

2.5.1 Speed indicator

Procedure

- ❍ **Remove the cap (2) by hand.**
- ❍ **Insert the indicator remover (1) exactly in the middle.**
- ❍ **Turn the indicator extractor (1) clockwise.**
- ❍ **Remove the speed indicator (3).**

2.5.2 RPM indicator

Procedure

- ❍ **Turn the RPM indicator (5) and the ring (4) and remove by hand.**

Remark

Items 8-11*
From 04.01 indicators and rings can only be ordered together.

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2.5.3 Clock hands

Procedure

- **Turn the second washer (6), minute hand (9) and hour hand (11) and remove them by hand together with items (7), (8) and (10).**
- **The ring (7) engages into the seconds plate (6).**
- **Rings (4), (8) and (10) are engaged into the relevant indicator.**

The rings prevent light escaping from the side.

2.5.4 Disengaging stop springs

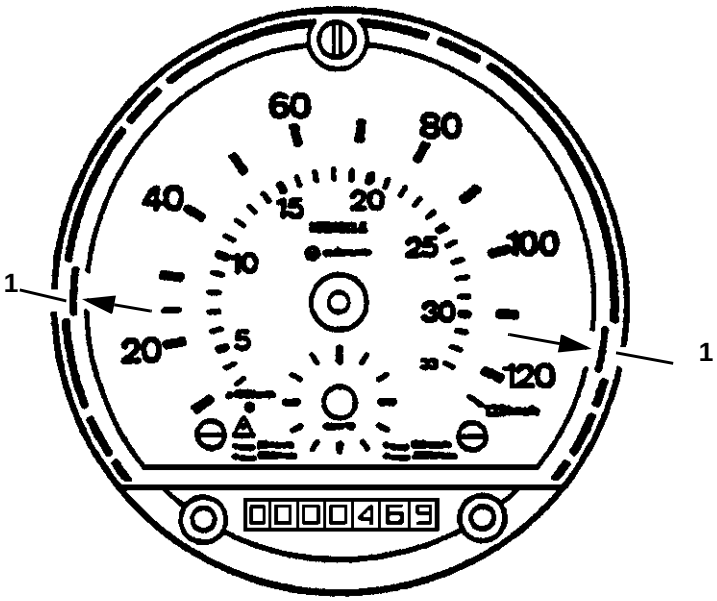

Fig. 2-10 Disengaging stop springs

1 Stop springs

Procedure

- **Disengage the stop springs (1) in the direction of the arrow using a watchmaker's screwdriver.**

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2.5.5 Removing and replacing dial elements

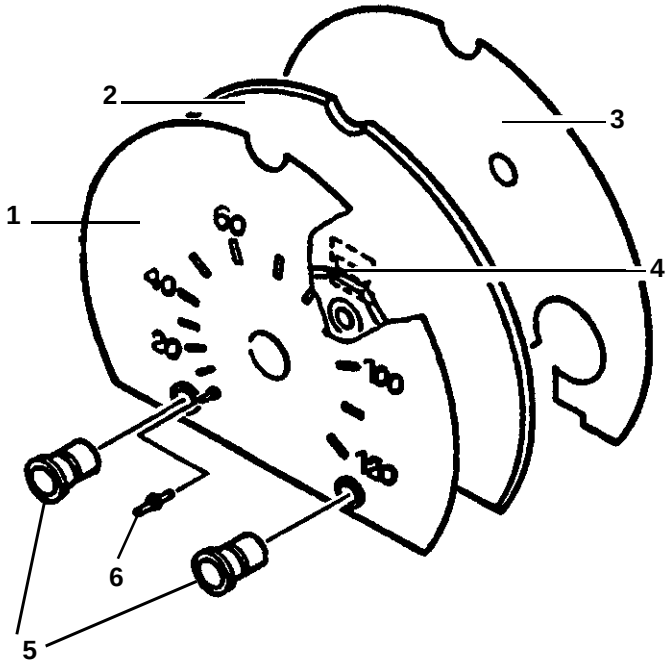

Fig. 2-11 Removing and replacing dial elements

1	Dial	**4**	Adhesive tape
2	Dial support	**5**	Diode holder
3	Reflector	**6**	Indicator stop pin

Remark

- Put a leather cloth or a clean cloth on the dial to prevent it from getting dirty (stains etc.).
- The diode holder (5), indicator stop pin (6) and adhesive tape (4) are used to connect the dial (1) and dial support (2).

Procedure

- ❍ **Remove the dial (1), dial support (2) and reflector (3) together.**
- ❍ **Remove the diode holder (5) from the dial support (2) by pressing from the back.**
- ❍ **Remove the indicator stop pin (6), max. Ø 1.4 mm, from the dial support (2) from the back. When doing this, do not damage the dial.**
- ❍ **Carefully remove the dial (1) from the adhesive tape (4).**
- ❍ **Hold the new dial by the edges and put in on the dial support (2) in such a way that the adhesive tape does not stick to it.**
- ❍ **Press the diode holder (5) and indicator stop pin (6) into the dial support (2) again.**
- ❍ **Press the dial (1) onto the adhesive tape (4).**

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Note

From 07.97 modified indicator stop pin (6):
Longer indicator stop pin (6) introduced for DC version (RPM units).

Modification

☞ Indicator stop pin (6) with 10 mm standard length changed to 13.2 mm special length

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

2.5.6 1318 with MOTOMETER dial

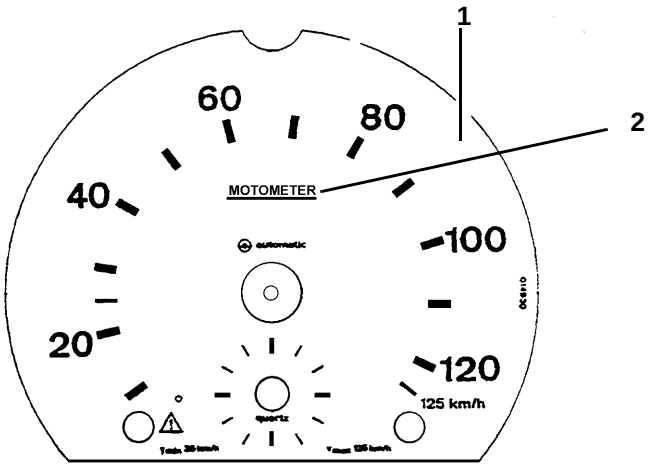

Fig. 2-12 MOTOMETER dial

1 Dial **2** Company logo

When carrying out any service work or technical checks, 1318 units – MOTOMETER version – must be handled in the same way as units from Siemens VDO Automotive.

Note

Units supplied with Motometer dial:

- 1318.02
- 1318.04
- 1318.24
- 1318.27

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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2.6 Removing cover plate/lamp plate

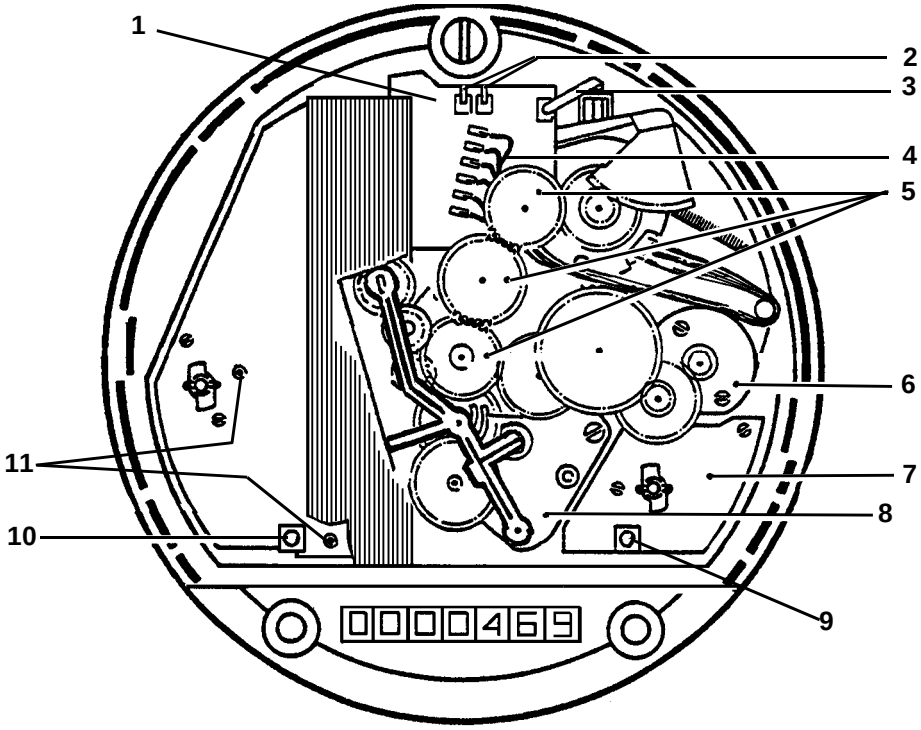

Fig. 2-13 Housing cover without dial elements (RPM units)

1 Cover plate
2 Cover contacts
3 n system contact spring
4 Wires
5 Spur gears
6 n measuring system
7 Lamp plate
8 Quartz mechanism
9 Warning LED
10 Warning LED
11 Coil connections

2.6.1 Removing gears from n measuring system

Procedure

- ❍ **Remove the spur gears (5).**

2.6.2 Unsoldering wires, contact spring and coil

Procedure

- ❍ **Unsolder all six wires (4) and the contact spring (3).**
- ❍ **Remove any solder using desolder wire or by suction using an automatic vacuum pump.**
- ❍ **Unsolder cover contacts (2) and coil connections (11).**
- ❍ **Remove any solder using desolder wire or by suction using an automatic vacuum pump.**

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2.6.3 Removing cover plate/lamp plate

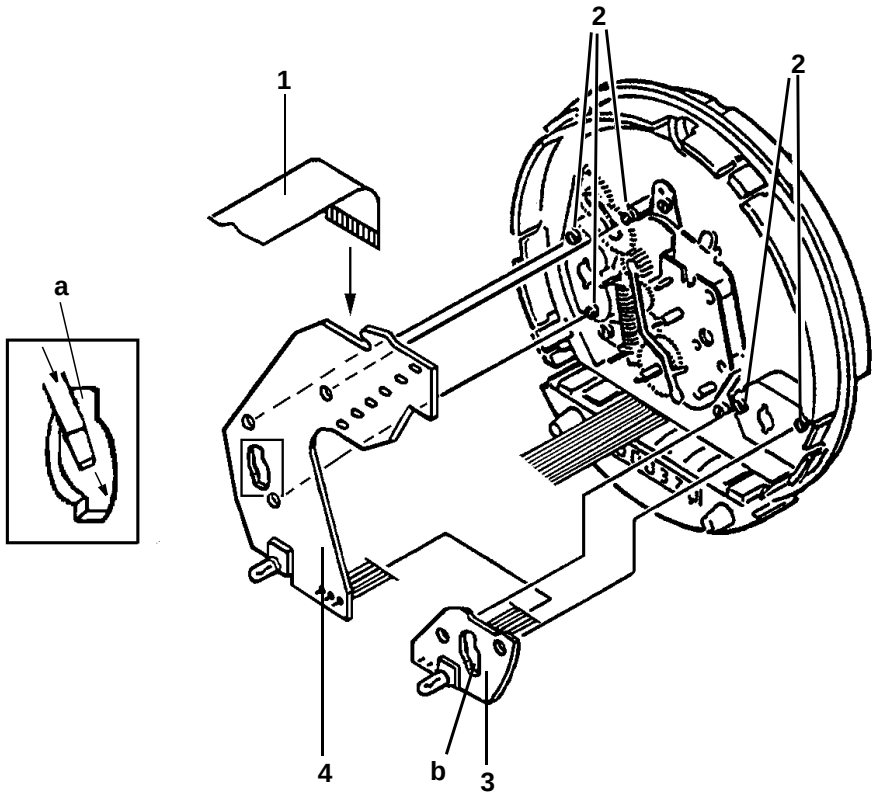

Fig. 2-14 Removing cover plate/lamp plate

1 Flat cable
2 Stop bolts
3 Lamp plate
4 Cover plate

! Note

- The five stop bolts (2) hold the cover plates (4) and lamp plate (3) in place.
- When removing the two plates, do not press the stop bolts together.

Procedure

- ❍ **Remove the bulbs from the holder by turning them anti-clockwise.**
- ❍ **Insert the screwdriver into (a) and remove the cover plate (4) by lifting it over the bevel of the lamp holder.**
- ❍ **Repeat by inserting the screwdriver into (b).**
- ❍ **Pull the cover plate (4) and flat cable (1) out of the stop bolts (2).**
- ❍ **Carefully remove the lamp plate (3) from the stop bolts (2) by hand.**
- ❍ **Lift the cover plate/lamp plate in the area of the distance counter and remove without damaging the contact springs.**
- ❍ **Turn the cover plate (4) and carefully pull the flat cable (1) out of the socket connector.**

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2.7 Flat cable

2.7.1 Flat cable versions for KTCO 1318

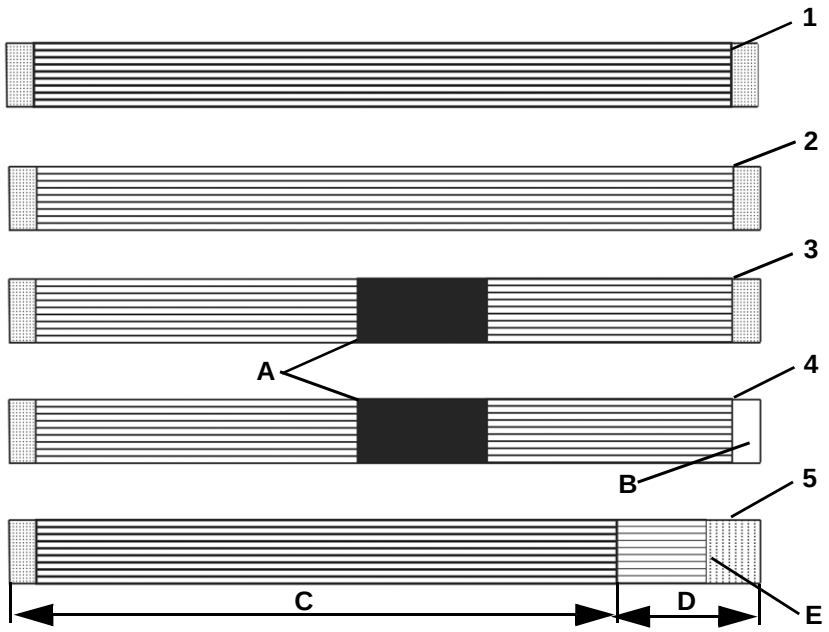

Fig. 2-15 Flat cable versions

No.	Order number	Description	Remarks	Usage
1	HS53-6800-695	Flat cable, 16x250	• Flexible flat cable	from 04.84 to 03.98
2	HS53-6800-039	Flat cable, 16x250	• Ultra-flexible flat cable 0.12 mm thick	from 04.98 to 09.98
3	HS53-6800-040	Flat cable, 16x250	• Ultra-flexible flat cable with reinforcing foil (A) at hinge	from 09.98 to 03.00
4	HS53-6800-040	Flat cable, 16x250	• Ultra-flexible flat cable with reinforcing foil (A) at hinge • Cover side marked in white on reinforced part (B)	from 09.98 to 03.00
5	HS53-6800-042	Flat cable, 16x250	• Area (C) reinforced from 0.12 mm to 0.17 mm • Area (D), 0.12 mm thick • Reinforced part (E) extended by 19 mm	from 03.00

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2.7.2 Fitting flat cable

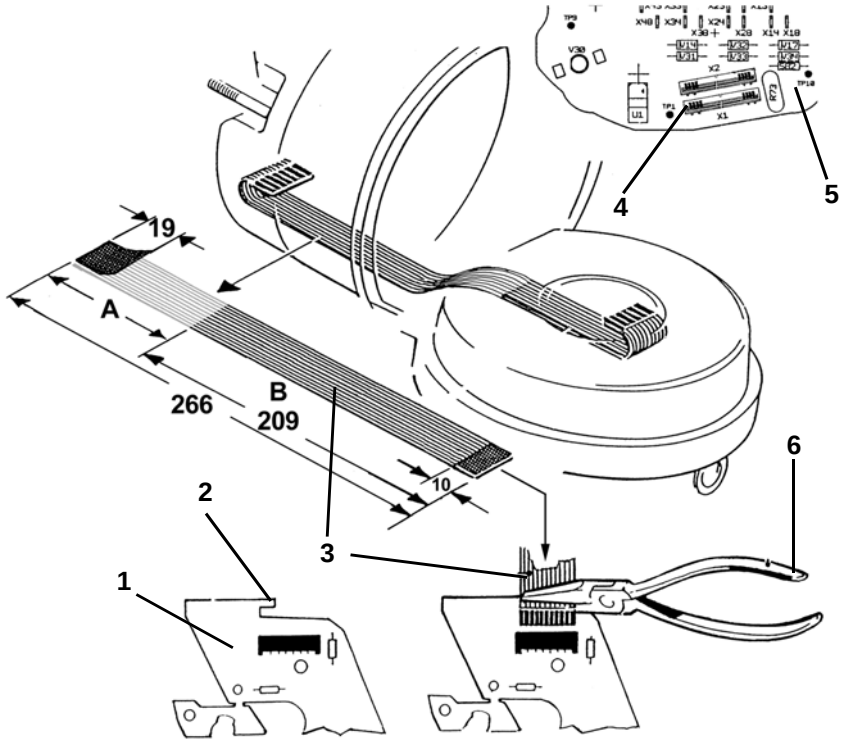

Fig. 2-16 Fitting flat cable

1	Cover plate / lamp plate	**4**	Socket connector
2	Lug	**5**	v board
3	Flat cable	**6**	Flat-nose pliers

! Note

- The flat cable (3) must not be bent when fitting it.
- Use standard flat-nose pliers (6) when fitting the flat cable (3).

Procedure

- ❍ **Insert the end with the 19 mm reinforced part into the socket connector (4) on the v board (5).**
- ❍ **Insert the reinforced part into the cover plate/lamp plate (1) 10 mm. When doing this, make a note of the lug (2).**
- ❍ **When fitted, the flat cable (3) must be positioned as shown.**

Remark

- Before 1994: Insert the flat cable (3)into units 1318-04, -25 and –26 with single-contact socket connectors (4) in such a way that contact is being made. Contacts are no longer accessible for troubleshooting.
  See Chapter 2.7.3 for troubleshooting instructions.
- Improving tachograph repairs:
  When replacing a defective clockwork mechanism, fit the latest ultra-flexible flat cable too.

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2.7.3 Measuring adapter for new flat cable (from 08.00)

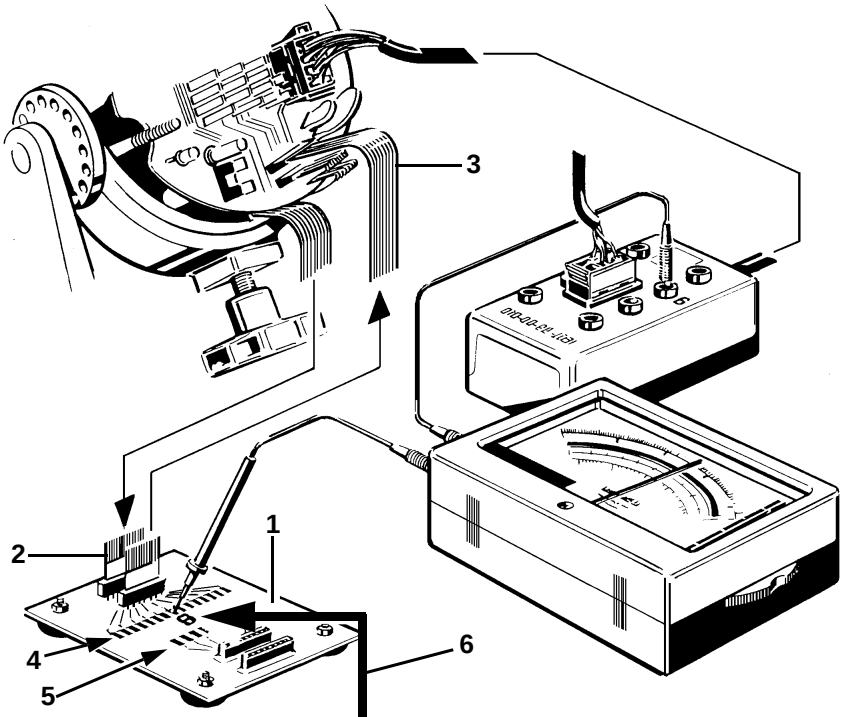

Fig. 2-17 Measuring adapter for new flat cable (from 08.00)

1 Measuring adapter

2 Flat cable on cover plate/lamp plate

3 Connection between v board and measuring adapter

4 Measuring points for 16-pin flat cable

5 Measuring points for 8-pin flat cable

6 Measuring point assignment/ fault analysis

Please refer to Chapter "7.6.1 Fault analysis - "Basic" microprocessor v board (µP)"

Error	**Component 1**	**Component 2**	**Component 1voltage check**				
			Mea-suring point colour	Conductor no. ()	12 V unit		24 V unit	
					v = 0 km/h	v = 60 km/h	v = 0 km/h	v = 60 km/h
Clockwork mechanism defective	K clockwork mechanism				❶ ❷			
		K clockwork mechanism	Flat cable 23 + (4) ((8)) 24 + (5) ((10))		0 V ...> 3.3 V imp		0 V ...> 3.3 V imp	
Illumination defective	M/M1 v board				❶ ❷			
		H 1 Illumination	Flat cable 25 + (6) ((12)) 22 + (3) ((6))		12 V		24 V	

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The adapter can be used for both 8-pin and 16-pin flat cables. For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

2.7.4 Replacing light emitting diode

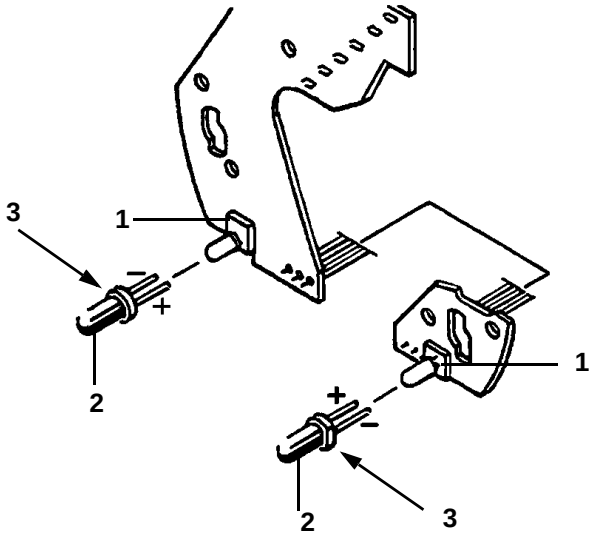

Fig. 2-18 Replacing light emitting diode

1 Self-adhesive seal
2 LED
3 Cathode connection (area)

Remark

- Depending on the customer-specific version, the LED (2) is either red or yellow.
- When soldering LED's, make a note of the correct polarity.
- Area (3) is the cathode connection.

Procedure

- ❍ **Remove the self-adhesive seal (1).**
- ❍ **Unsolder the LED (2).**
- ❍ **Insert the seal (1).**

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2.8 n measuring system

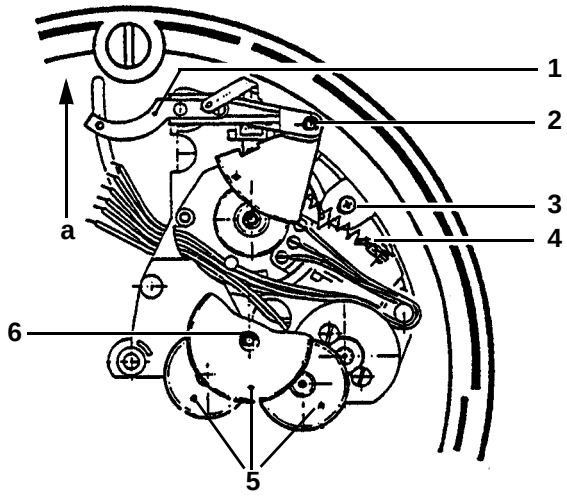

Fig. 2-19 Removing n measuring system

1 Stylus lever
2 Retaining washer
3 Filister head screw
4 Tension spring
5 Spur gears
6 Retaining washer

2.8.1 Removing n measuring system

Procedure

- ❍ **Unhook the tension spring (4) and move the stylus lever (1) in the direction of the arrow (a).**
- ❍ **Undo the filister head screw (3).**
- ❍ **Remove the n measuring system.**

2.8.2 Removing stylus lever

Procedure

- ❍ **Remove the retaining washer (2).**
- ❍ **Remove the stylus lever (1).**

2.8.3 Replacing gears

Procedure

- ❍ **Remove the retaining washer (6).**
- ❍ **Remove the spur gears (5).**
- ❍ **Put the spur gears (5) on again (no specific order).**

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2.8.4 Removing contact springs with holder on n measuring system

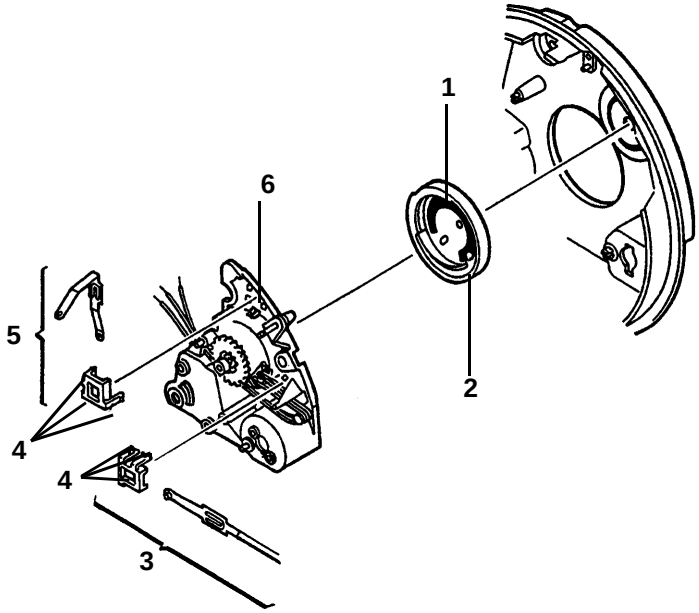

Fig. 2-20 Removing contact springs on n measuring system

1 Contact carrier
2 Contact path
3 Contract spring with holder
4 Catch lug
5 Contact spring with holder
6 n frame

Remark

If this component is defective, replace the n frame (6) and integral potentiometer unit.

Procedure

❍ **Remove the contact springs and holders (3) and (5) by disengaging the catch lugs (4).**

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2.8.5 Fitting contact spring and holder

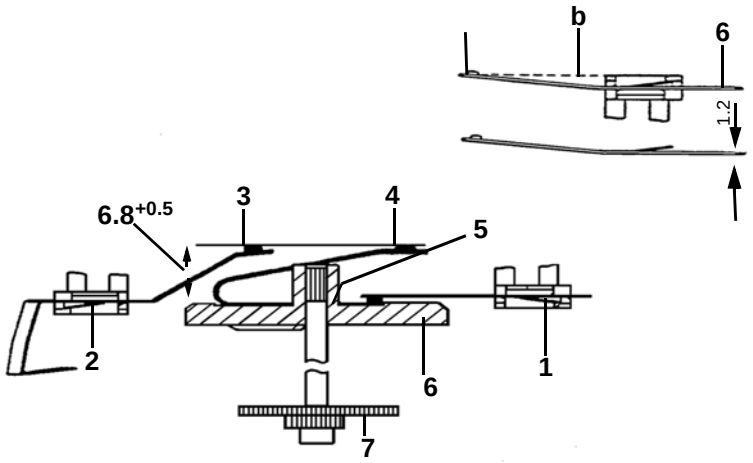

Fig. 2-21 Fitting contact spring and holder

1	Contact spring with holder	**5**	Contact path
2	Contact spring with holder	**6**	Driver plate
3	Contact rivet	**7**	Spur gear
4	Driver contact		

Remark

- The driver contact (4) and contact path (5) are welded to the driver plate (6).
- The driver plate (6) is located on the same axle as the integral potentiometer's resistor and spur gear (7).

Procedure

❍ **With the contact spring (1) the contact rivet (3) must extend over the fictious line (b) (pre-tensioned).**

▶ **The contact sits firmly on the spur gear's (7) contact path.**

❍ **When fitted, adjust the contact rivet (3) on the contact spring and the holder (2) in such a way that they are level with the driver contact (4).**

▶ **Contacts (3) and (4) sit firmly on the contact carrier's (7) contact path. (Fig. 2-20)**

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2.8.6 Checking integral potentiometer

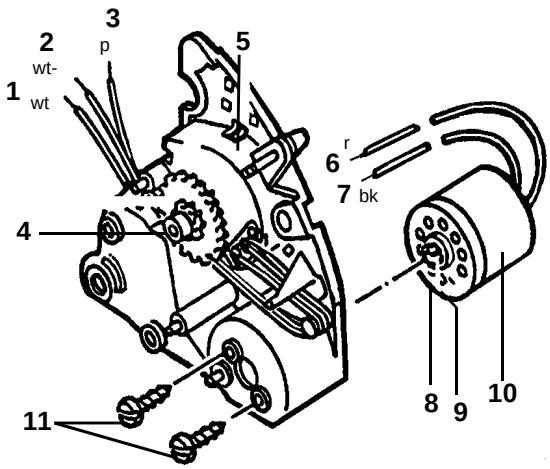

Fig. 2-22 Checking potentiometer

1 Wire wt
2 Wire wtr
3 Wire pink
4 Spur gear
5 n frame
6 Wire red
7 Wire bk
8 Motor pinion
9 Collar
10 Motor
11 Filister head screws

! Note

Defective n frame:
Resistance value changes abruptly when turning the spur gear (4).

Action to be taken:
Replace the n frame (5) and integral unit.

Remark

- Depending on the direction of rotation of the spur gear (4) , the resistance value must increase or decrease steadily (about 170 Ω...5 KΩ).
- The measured value on the wires must not exceed 5 KΩ ± 10% .

Procedure

- ❍ **Connect a measuring device between wires (1) and (3).**
- ❍ **Determine the resistance value.**
- ❍ **Connect the measuring device to wires (2) and (3).**
- ❍ **Turn the spur gear (4) slowly and steadily to determine the resistance value.**

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2.8.7 Checking DC motor

! Note

Defective DC motor:
Resistance value changes abruptly when turning on the motor pinion (8).

Action to be taken:
Replace the DC motor.

! Note

The measured value on the wires must not exceed 50 Ω ± 12%.

Procedure

- ❍ **Visually check the DC motor.**
- ❍ **Check that the motor pinion is running (8) freely.**
- ❍ **Connect a measuring device between wires (6) and (7).**
- ❍ **Turn the motor pinion (8) steadily to determine the resistance value.**

2.8.8 Removing and installing DC motor

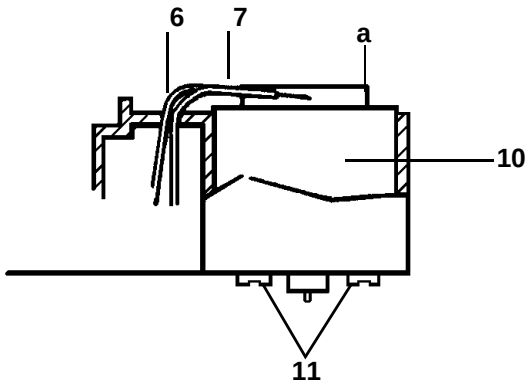

Fig. 2-23 Checking, removing and installing DC motor

6 Wire
7 Wire
9 Collar
10 Motor
11 Filister head screws

Procedure

- ❍ **Undo the filister head screws (11) and pull the motor (10) out.**
- ❍ **Insert a replacement motor and run wires (6) and (7) as shown in Abb. 2-22.**

The collar (9) enables the motor to be centred precisely.

- ❍ **Screw the filister head screws (11) on.**

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2.8.9 Modified n frame (from 02.00)

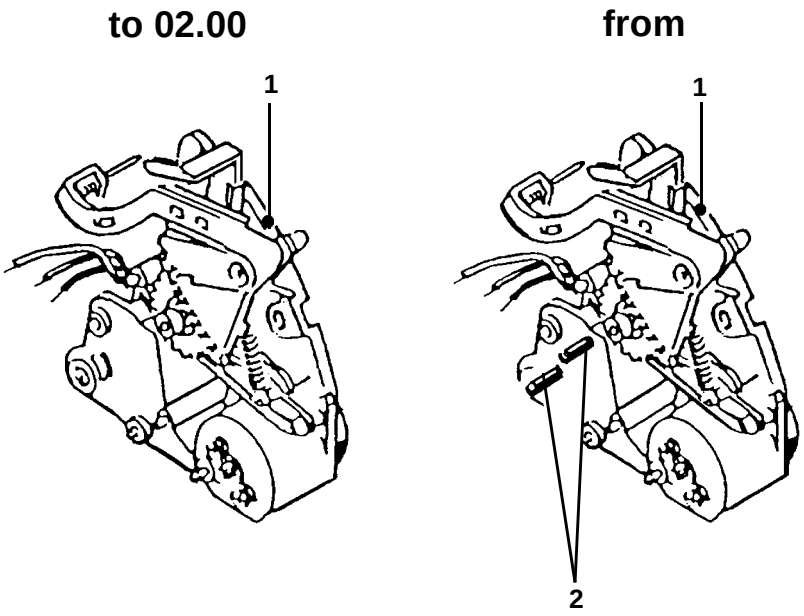

Fig. 2-24 Modified n frame (from 02.00)

1 n frame **2** Straight pins

Modification ☞ Straight pins (2) on n frame (1).

! Note

The two straight pins (2) prevent the transmission gears from rubbing on the reflector located above them.

From manufacturing number 3.018.818, this has been standard on all RPM units. For order number please refer to the 1318 Electronic Product Catalogue (EPC).

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2.9 Quartz mechanism

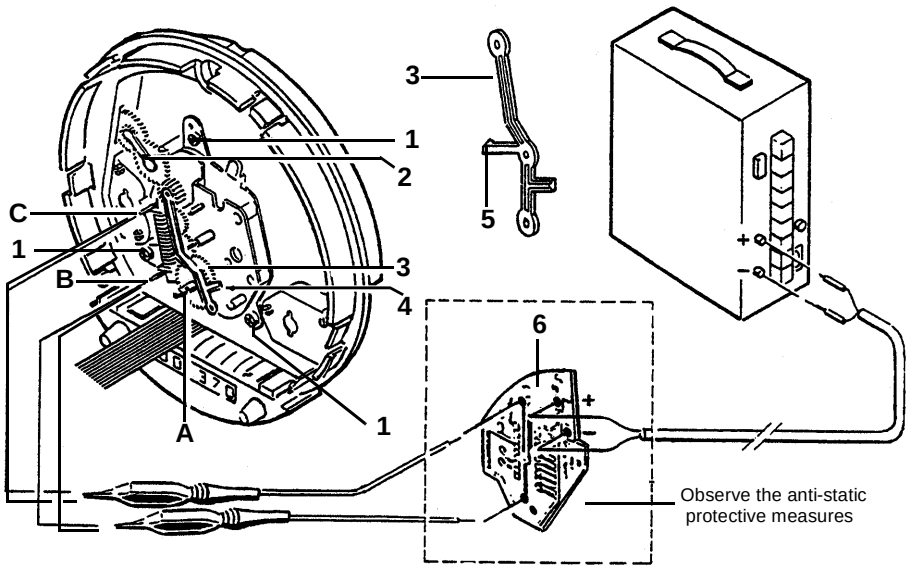

Fig. 2-25 Checking quartz mechanism

1 Filister head screws (3x)
2 Bridge
3 Bridge
4 Quartz mechanism
5 Flat cable guide
6 1311 electronic quartz board

2.9.1 Checking fibre glass quartz mechanism

Remark

With 1318 units the quartz electronic unit is located on the v board.
To check the clockwork mechanism, the mechanism's electronic quartz board (6) must be controlled by the 1311 unit.

Visual checks

- **Check that all gears are running smoothly and have play. When doing this, make a note of foreign bodies and damaged gears.**
- **Bridges (2) and (3) must be seated firmly so that all the indicator adjustment gears engage properly.**

Checking coil resistance

- **Connect a measuring devices to points (B) and (C).**
- **The measured value must not exceed 1.5 to 2 KΩ.**
- **Replace the mechanism if the resistance value is outside tolerances.**

Checking mechanism function

- **Push the clock hands and second hand down onto point (A).**
- **Replace the mechanism completely if time differences are outside permissible tolerances.**

For tolerances please refer to the TPH, TU00.1308.01 000 01, Section 3, Chapter 8.
From 09.93 the bridge (3) has a flat cable guide (5).

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2.9.2 Removing fibre glass quartz mechanism

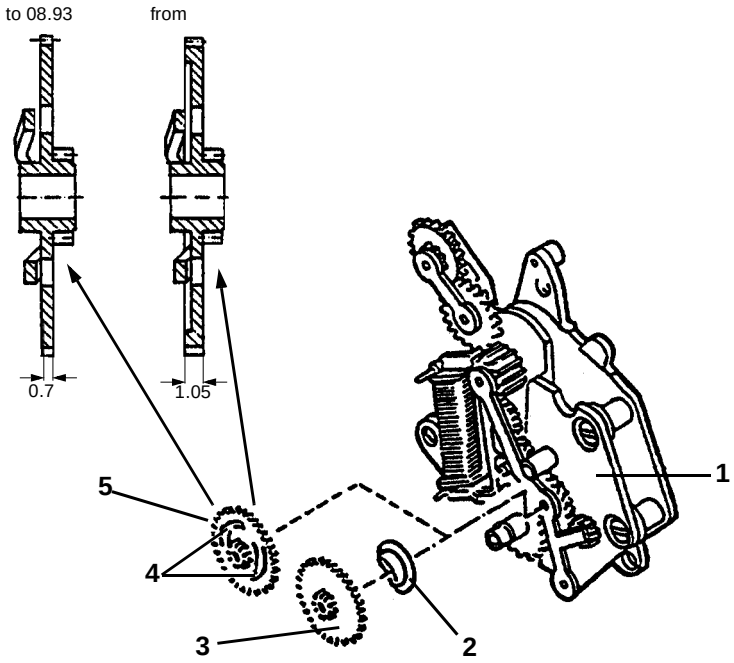

Fig. 2-26 Replacing gears

1 Board
2 Spring washer
3 Change gear
4 Spring
5 Change gear

Procedure

- ❍ **Undo the filister head screws (1) Abb. 2-25.**
- ❍ **Remove the mechanism from the housing cover.**

2.9.3 Replacing gears

! Note

The spring washer (2) underneath the change gear (3) is not necessary if the modified change gear (5) with moulded springs (4) is used.

Procedure

- ❍ **All the gears at the top of the board (1) must be replaced if defective.**

Remark

No additional repair release will be given.

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2.9.4 Modified quartz mechanism

2.9.4.1 Fibre glass quartz mechanism (from 11.96)

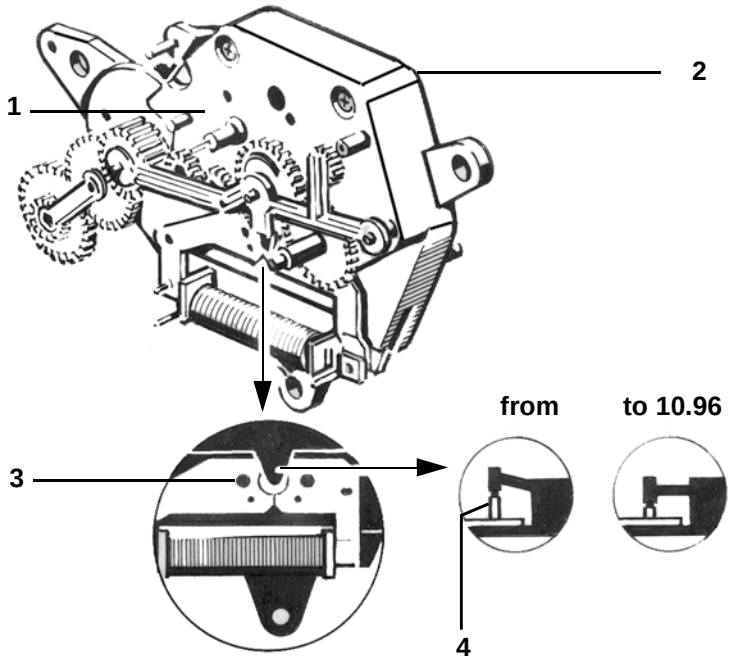

Fig. 2-27 Fibre glass quartz mechanism (from 11.96)

1 Quartz mechanism
2 Side
3 Fixing points
4 Rotary drive

Modification

- ☞ Gears fully enclosed - side (2).
- ☞ Improved gear (not shown)
- ☞ Additional fixing points (3) on stator plates.
- ☞ Longer rotary drive (4).

From manufacturing number 2.155.675 and since week 45/96, this has been standard. For order number please refer to the 1318 Electronic Product Catalogue (EPC).

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2.9.4.2 Clockwork mechanism bridge with flat cable guide (from 07.97)

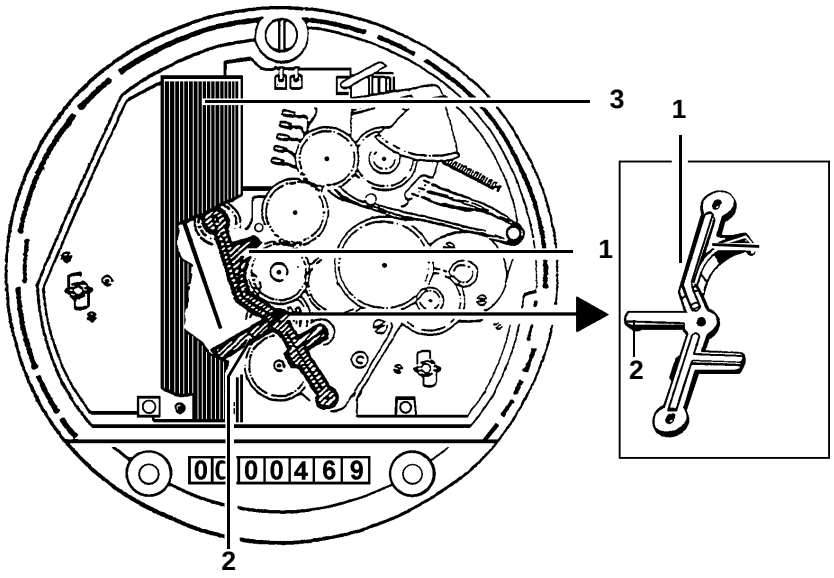

Fig. 2-28 Bridge with guide on mechanism

1 Bridge
2 Guide
3 Flat-ribbon cable

Modification

☞ Flat cable (3) guide (2) on bridge (1).

Bridge (1) is included in the 1318.0106.060.000 parts kit. Standard since manufacturing number 2.356.426.

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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2.9.4.3 Quartz mechanism made of transparent plastic (from 03.98)

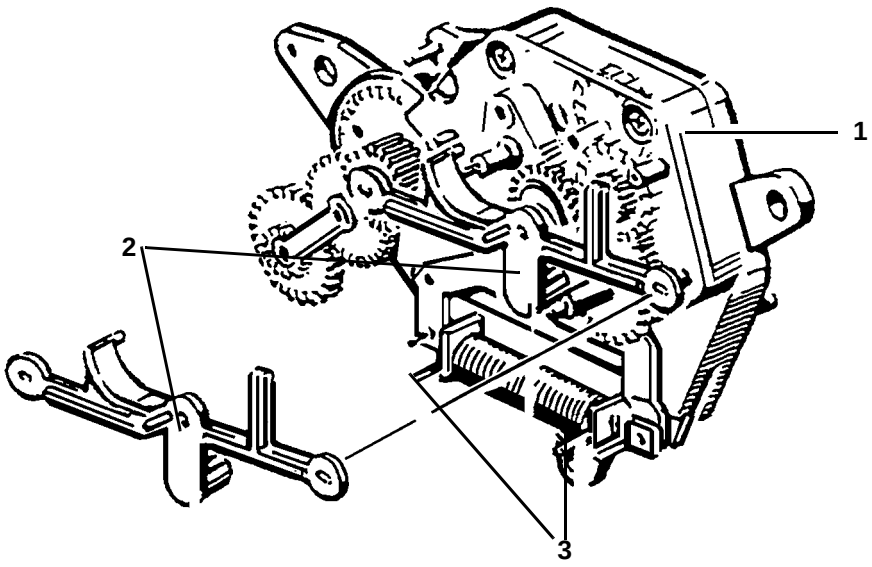

Fig. 2-29 Clockwork mechanism made of transparent plastic

1 Quartz mechanism
2 Rotor cover
3 Coil pins

! Note

When unsoldering and soldering the clockwork coil, there is a high risk that the coil pins (3) will be displaced and the coil wire will break.

With soldering you must ensure the following:

- Do not apply too much heat for too long a time.
- Do not exert any force on the cover plate/lamp plate.
- Remove any solder using desolder wire or by suction using an automatic vacuum pump.

Modification

☞ Material: transparent plastic instead of glass fibre.

☞ Rotor cover (2) fitted to bridge.

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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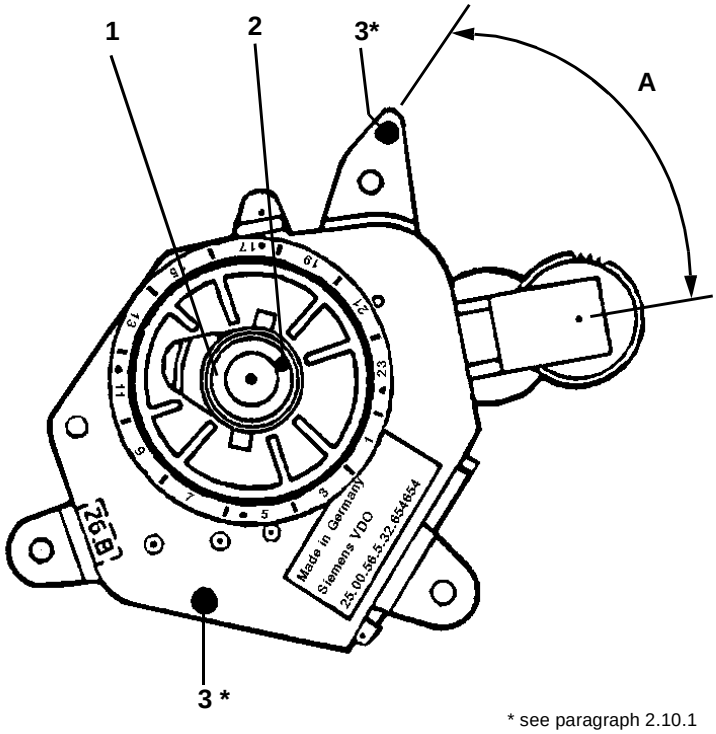
2.9.5 Speed shaft

2.9.5.1 Replacing speed shaft



* see paragraph 2.10.1

Fig. 2-30 Speed shaft

1 Speed shaft
2 Driver pin
3 Centring pins

Procedure

- ❍ **Pull the defective speed shaft (1) from the clockwork mechanism.**
- ❍ **Insert the speed shaft (48.8 mm long) into the clockwork mechanism so that the driver pin (2) is located in area (A).**
- ❍ **Push the speed shaft in up to the stop.**

Because of the pressure spring and the torsion spring in the mechanism, the shaft will spring back.

2.9.5.2 Checking speed shaft

Procedure

- ❍ **Push the speed shaft (1) down using flat tweezers.**
- ❍ **Turn the driver pin (2) about 90 degrees in both directions and let it spring back to its initial position.**
- ❍ **If the driver pin (2) does not spring back to area (A), replace the mechanism completely.**

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2.10 Cover contact

2.10.1 Replacing cover contact

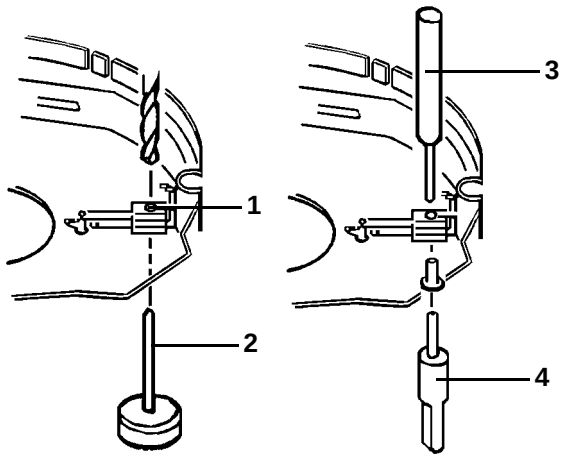

Fig. 2-31 Removing cover contact

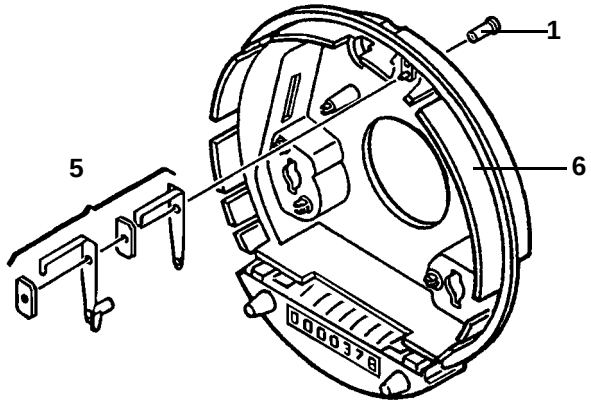

Fig. 2-32 Riveting cover contact

1	Tubular rivet head	**4**	Rivet holder
2	Drilling support	**5**	Contact kit
3	Riveting dies	**6**	Cover

Procedure

❍ **Drill the tubular rivet head (1) out using a grooved bit.**
Use the drilling support (2) for this.

❍ **Remove the contact kit (5) completely.**

❍ **Remove any drilling chips.**

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❍ **Rivet the new contact kit (5) to the cover (6) so that it doesn't have any play using the rivet holder (4) and riveting die (3) for tubular rivets – outer diameter 2.0 mm.**

2.10.2 Checking cover contact

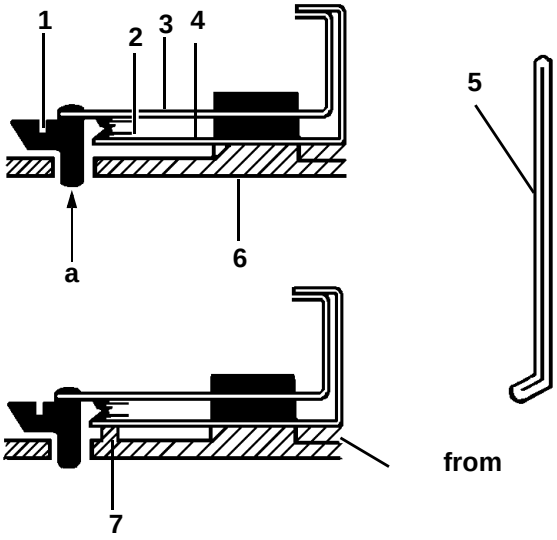

Fig. 2-33 Checking cover contact

1 Plastic part
2 Contact
3 Contact spring 1
4 Contact spring 2
5 Adjustment lever
6 Cover base
7 Lug

✓ Condition

Contact spring 1 (3) is parallel with the cover base (6).

— **or** —

The pre-tensioned contact spring 2 (4) sits on the lug (7).

Procedure

❍ **Lift contact spring 1 (3) so that the plastic part (1) comes off the cover slightly.**

In this way the contacts (2) are securely closed.

❍ **Push the plastic part (1) down in the direction of the arrow (a) until the upper edge is flush with the cover base (6).**

When doing this, the contact (2) must be open.

❍ **Use the adjustment lever (5) to correct this if necessary.**

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2.11 Fitting quartz mechanism, n measuring system, lamp plate and cover plate

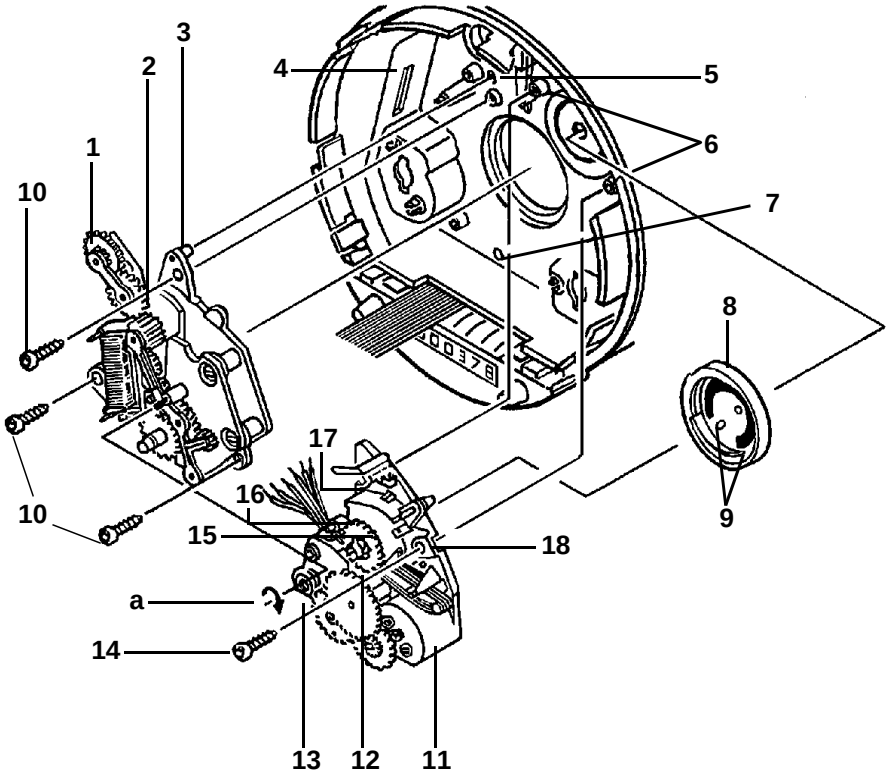

Fig. 2-34 Fitting quartz mechanism and n measuring system

1 Indicator setting wheel
2 Quartz mechanism
3 Centring pins
4 Slot
5 Centring points
6 Cover fixing pin
7 Centring points
8 Contact carrier
9 Contact path tips
10 Filister head screws
11 n measuring system
12 Spur gear
13 Drilled hole
14 Filister head screw
15 Drilled hole
16 Recess
17 Recess
18 Recess

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2.11.1 Fitting quartz mechanism

Procedure

- **Insert quartz mechanism (2) into the cover.**
- **Align the clockwork mechanism with the centring points (5) and (7) to centre it.**
- **Fix the quartz mechanism to the cover using the filister head screws (10).**

Torque 200 ... 300 Nmm.

2.11.2 Fitting n measuring system

Remark

When fitted correctly, the spur gear (12) can be turned to the stop in the direction of the arrow (a). The drilled hole (15) is opposite the the recess (16).

Procedure

- **Align the contact carrier's (8) contact path tips (9) in the direction of the distance counter.**
- **Insert the contact carrier (8) into the cover.**
- **Make sure that the contact path is clean.**
- **Turn the spur gear (12) to the stop against the direction of the arrow (a).**

The drilled hole (15) points to the recess (18).

- **Insert the n measuring system (11).**

The drilled hole (13), recess (17) and the two cover fixing pins centre the n measuring system.

- **Fix the n measuring system to the cover using the filister head screw (14).**

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2.11.3 Fitting n stylus lever

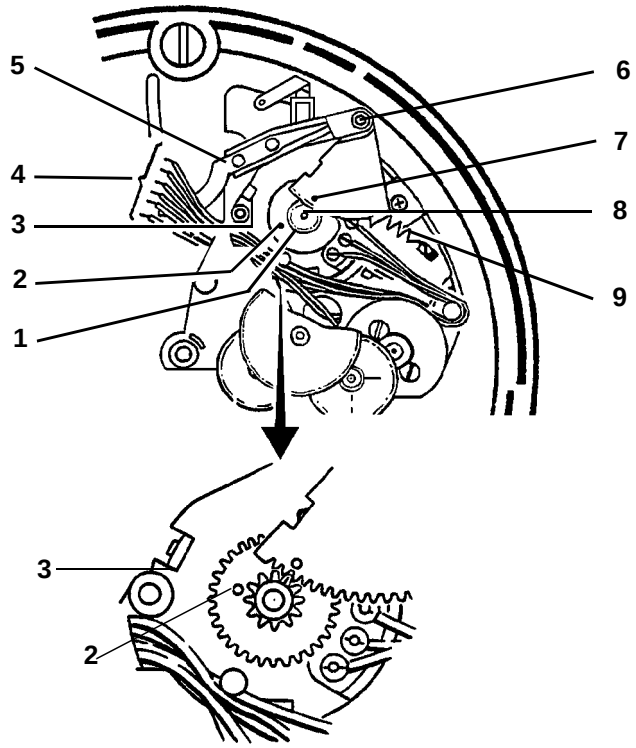

Fig. 2-35 Fitting n stylus lever

1 Spur gear
2 Drilled hole
3 Angle piece
4 Wires
5 n stylus lever
6 Retaining washer
7 Marking
8 Chamfer
9 Tension spring

Procedure

- ❍ **Turn the spur gear (1) until the drilled hole (2) points to the angle piece (3).**
- ❍ **Then put the n stylus lever (5) on in such a way that the marking (7) is opposite the moulded chamfer (8).**
  - – With the 2-driver version the stylus is 15 mm long.
  - – With the 1-driver and 7-day versions the stylus is 20.5 mm long.
- ❍ **Fit the retaining washer (6).**
- ❍ **Hook the tension spring (9) in.**

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2.11.4 Fitting cover plate and lamp plate

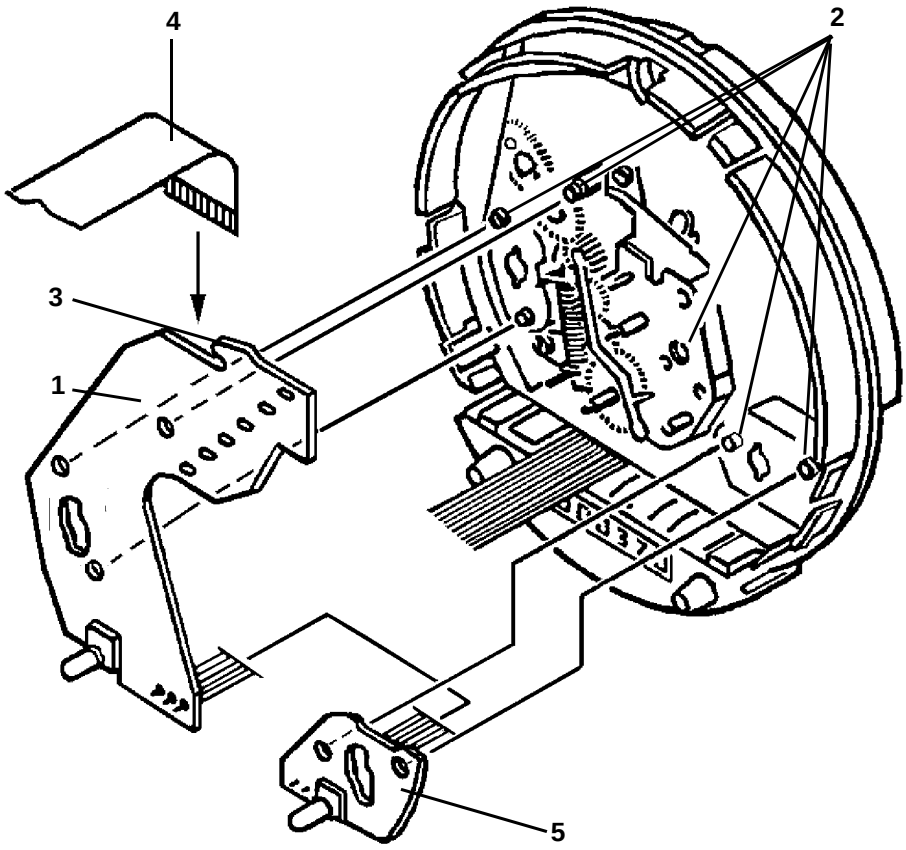

Fig. 2-36 Fitting cover plate and lamp plate (n measuring system not shown)

1 Cover plate
2 n stylus lever
3 Cut out
4 Flat cable
5 Lamp plate

Procedure

❍ **Plug the flat cable (4) into the socket connector on the back of the cover plate (1) and insert it into the cut out (3).**

From 03.98 an ultra-flexible 16-pin flat cable is used with the 1318, see page 2-20.

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2.11.5 Clockwork mechanism malfunction

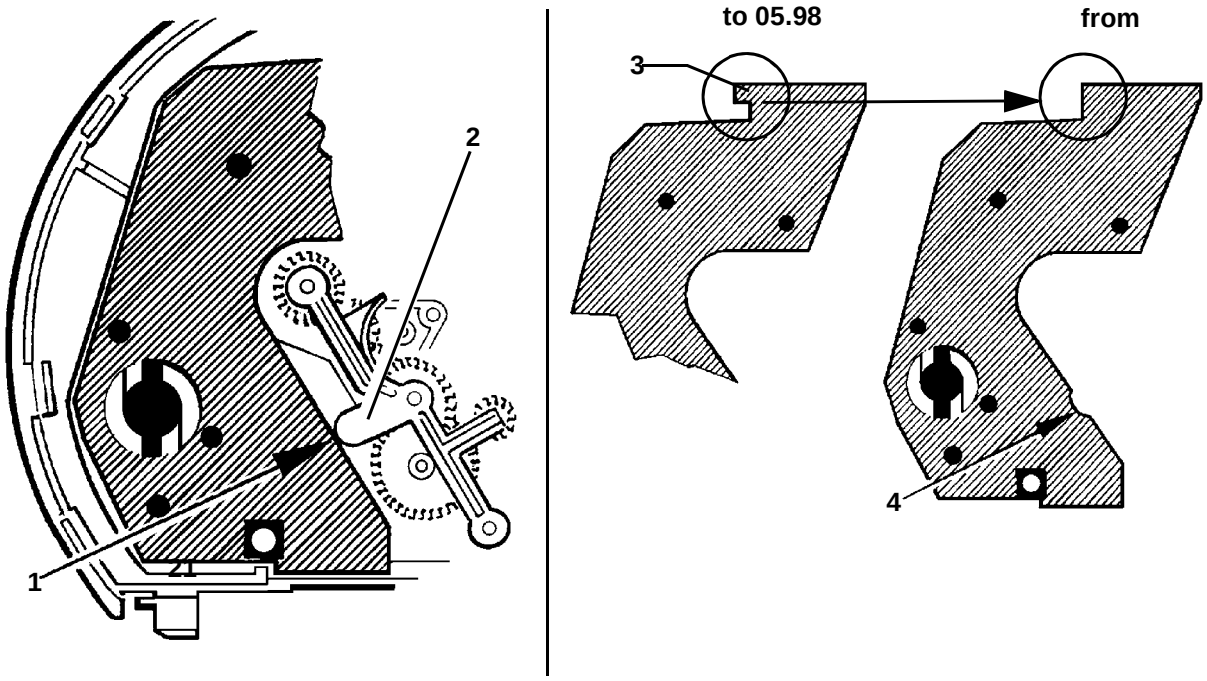

Fig. 2-37 Modified cover plate with rotor cover

1 Cover plate
2 Rotor cover
3 Lug
4 Recess

Remark

There must be small gap between the rotor cover (2) on the bridge and the cover plate/lamp plate (1).

- If not, use a round file to rework the cover plate.
  When doing this, make sure not to damage the conductor.
- From 06.98 reworking is no longer necessary. The recess (4) is standard.

Modification

☞ The lug (3) is no longer necessary.

☞ There is a recess (4) instead.

Standard since 06.98. For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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2.11.6 Making electrical connections

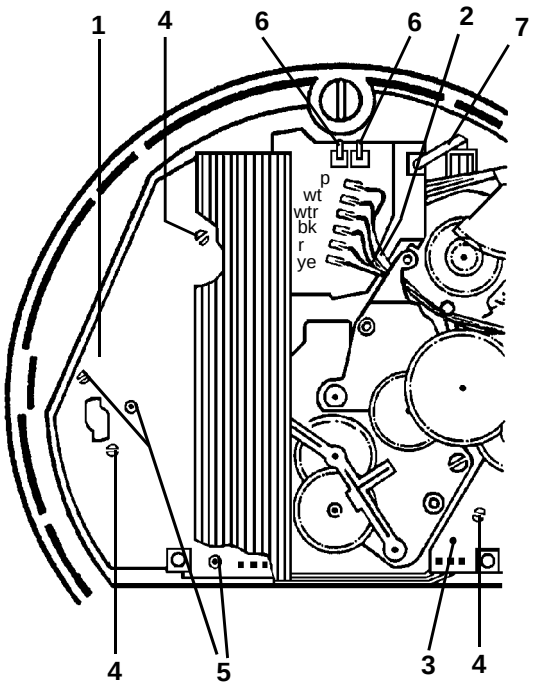

Fig. 2-38 Cover plate/lamp plate – making electrical connections

1 Cover plate
2 Wires
3 Lamp plate
4 Stop bolts
5 Coil connections
6 Cover contact
7 n contact

Remark

Run the wires of the n measuring system and cover plate/lamp plate in such a way that they do not rub on the gears.

Procedure

- **Push the contact springs (6) and (7) down onto the cover plate's (1) contact areas.**
- **The coil connections (5) protrude from the cover plate (1).**
- **Push the cover plate (1) and lamp plate (3) down onto stop bolts (4).**
- **With speed units solder on the contacts (6), (7) and coil connections (5).**
- **With RPM units the contact (7) and wires (2) must be soldered on too (see fig. 2-38).**
- **Run the wires of the n measuring system, cover plate and lamp plate.**

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2.11.7 n measuring system - Inserting spur gears

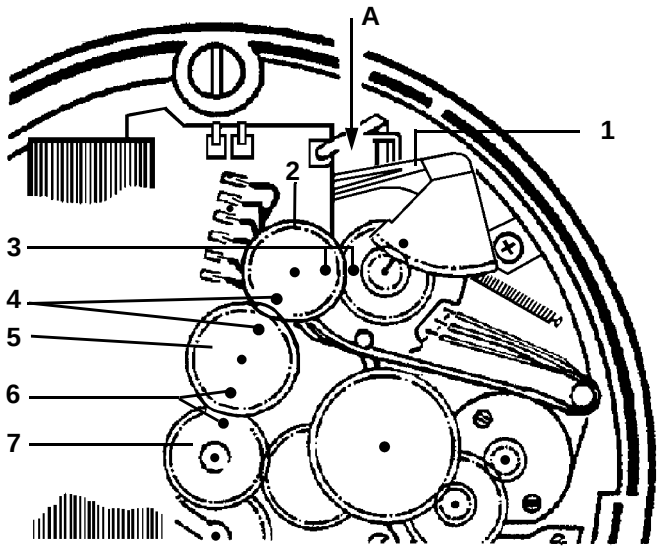

Fig. 2-39 Inserting spur gears

1 n stylus lever
2 Spur gear
3 Drilled holes a
4 Drilled holes b
5 Spur gear
6 Drilled holes
7 Gear

Modified since 09.92

☞ Spur gear gearing increased from 0.5 mm to 3.5 mm.

Procedure

- ❍ **Push the n stylus lever (1) in the direction of the arrow (A) to the stop.**
- ❍ **Insert the spur gear (2).**
- ❍ **The drilled holes a (3) must be opposite one another.**
- ❍ **Insert the spur gear (5).**
- ❍ **The drilled holes b (6) must be opposite one another.**
- ❍ **Insert the spur gear (7).**
- ❍ **The drilled holes (6) must be opposite one another.**

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2.12 Fitting dial components and indicators

2.12.1 Fitting dial components

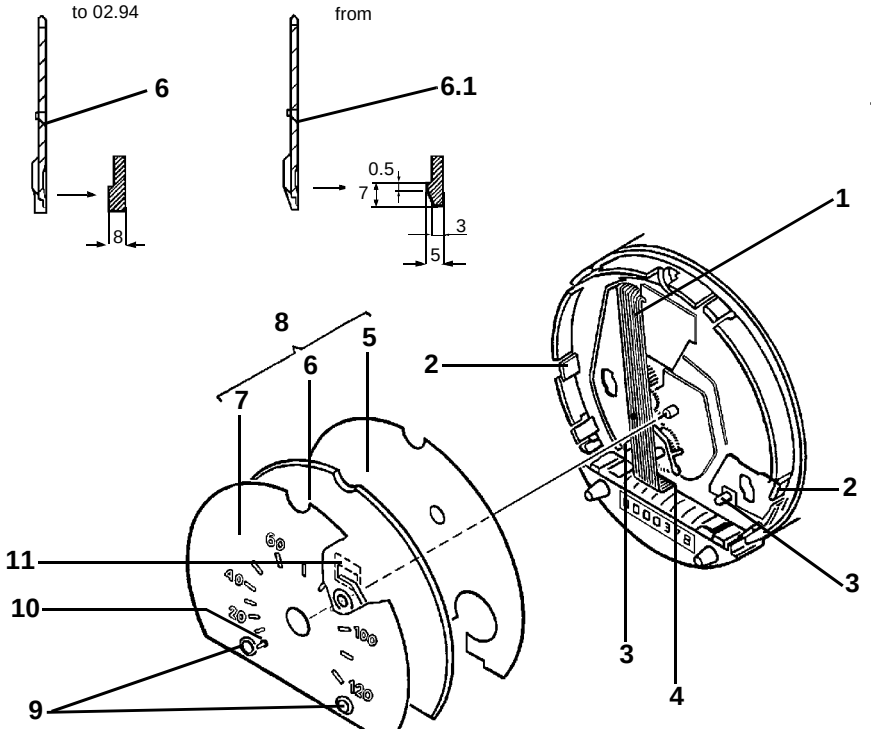

Fig. 2-40 Fitting dial components

1 Flat cable
2 Stop springs
3 Diodes
4 Cut out
5 Reflector
6 Dial support
6.1 Dial support with chamfer
7 Dial
8 Complete unit
9 Diode holder
10 Stop pin
11 Adhesive tape

Procedure

- ❍ **Insert the flat cable (4) into the cut out (4).**
- ❍ **Put the reflector (5) on the dial support (6) with the white side facing towards it.**
- ❍ **Insert the complete unit (8) into the cover.**

! Note

- When replacing the flat cable (1), always install the dial support with chamfer (6.1). It is standard from 02.94.
- The diode holder (9), stop pin (10) and adhesive tape (11) connect the dial support 6) and the dial (7).
- The diodes (3) must engage into the holder (9) and the stop spring (2) into the dial support (6).

Put a leather cloth or a clean cloth on the dial (7) to prevent it from getting dirty (stains etc.).

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2.12.2 Making auxiliary bezel

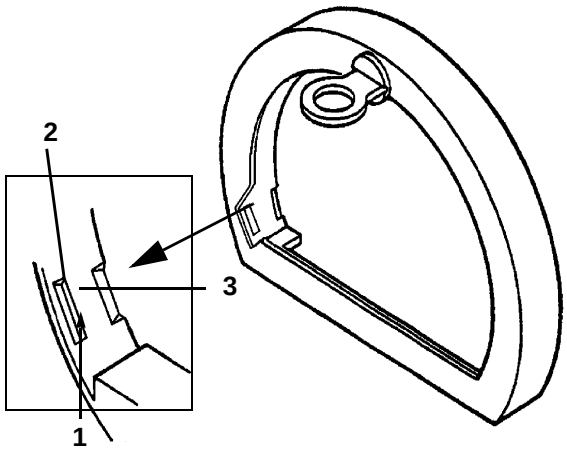

Fig. 2-41 Making auxiliary bezel

1 Edge
2 Recess
3 Cutout?

! Note

Use the auxiliary bezel when fitting the indicators.
This guarantees that the unit opens and closes properly.

Procedure

- ❍ **Remove the dial glass.**
- ❍ **Chamfer the edge (1) on the recess (2) 45° to make the cut out (3).**
- ❍ **Do this for all 4 recesses on the bezel.**

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2.12.3 Fitting n and v indicators

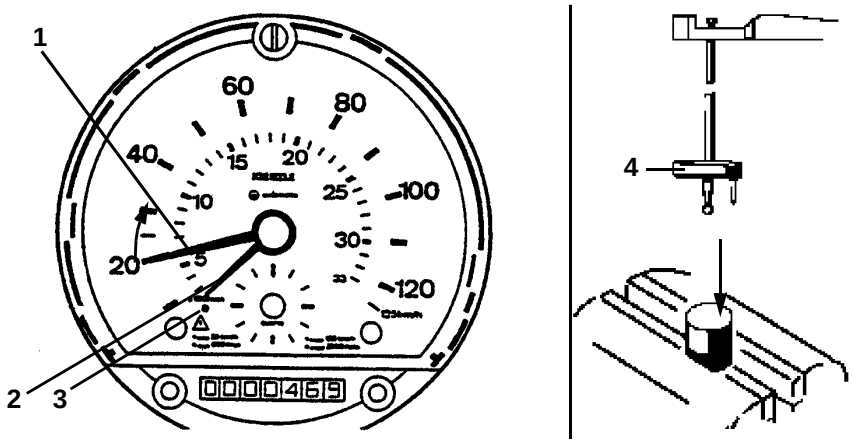

Fig. 2-42 Fitting indicators / pressing on v indicator

1 v indicator
2 n indicator
3 Indicator stop pin
4 Speed shaft

Procedure

- ❍ **Push the auxiliary bezel on.**
- ❍ **The n and v measuring systems are in their initial positions.**
- ❍ **Close the housing cover.**
- ❍ **Push the n indicator (2) on.**

The indicator's tip must point to the 2nd zero of the "x100/min" dial labelling.

- ❍ **Push the v indicator (1) on by hand so that it points to about 20 km/h and turn it into the direction of the arrow until the speed shaft (4) engages into the coupling.**
- ❍ **Then turn the v indicator back until the indicator is about 1 mm away from the indicator stop pin (3).**
- ❍ **Now press the v indicator on.**
  When doing this, open the housing cover and support the speed shaft (4).

2.12.4 Checking indicator running

Check

- ✓ With RPM units the distance between the v indicator and the n indicator should be 0.3 mm.
- ✓ With speed units the distance between the v indicator and dial should be 0.3 mm.
- ✓ When the housing cover is closed, the v indicator may move away from the indicator stop pin by about one indicator width*.
- ✓ Correct this if necessary, i.e. remove the v indicator and fit it again.

Remark

* With some models the distance can be about 1 cm!

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2.12.5 Checking engagement depth

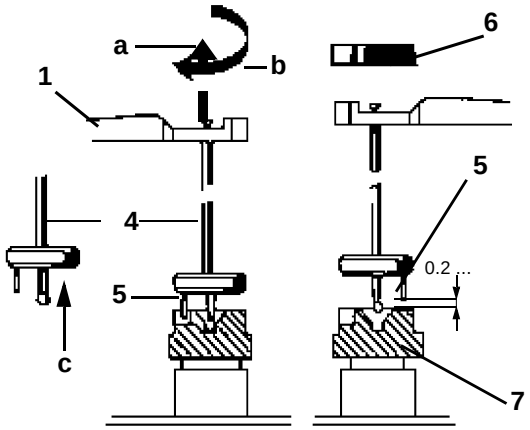

Fig. 2-43 Checking engagement depth

1 v indicator
2 Speed shaft
3 Driver pin
4 Cap
5 Coupling

Procedure

- ❍ **Push the speed shaft (4) down firmly in the direction of the arrow (c).**
- ❍ **Close the housing cover.**
- ❍ **Pull out the v indicator (1) in the direction of (a) and turn it in the direction of (b).**

The play between the driver pin (5) and the coupling (7) must be 0.2 to 1.0 mm.

- ❍ **Release the v indicator (1).**

The speed shaft (4) must spring back into its initial position.

- ❍ **When turning in the direction of the arrow (b) and without pulling in the direction of (a), the driver pin (5) must not disengage.**
- ❍ **Then press the cap (7) on.**

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2.12.6 Fitting clock hands

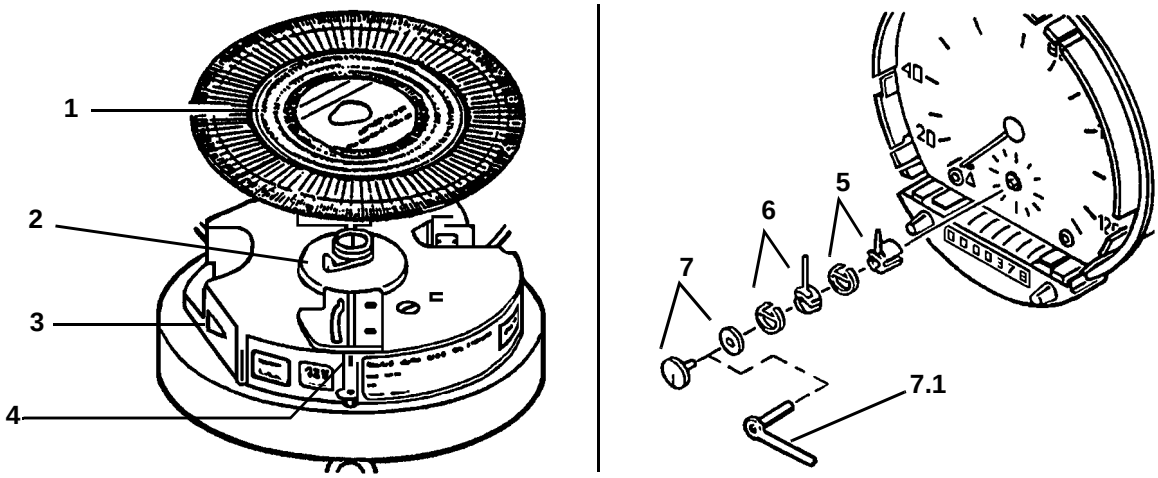

Fig. 2-44 Inserting adjustment disc / fitting clock hands

1 Adjustment disc
2 Tachograph chart turntable
3 Indicator setting wheel
4 Marking
5 Hour hand
6 Minute hand
7 Second washer
7.1 Second hand

Remark

Adjust the speed stylus before fitting the clock hands.

Procedure

- ❍ **Insert the adjustment disc (1).**
- ❍ **Set the tachograph chart turntable (2) to 12.15 p.m. using the indicator setting wheel.**

Use the marking (4) for reference.

- ❍ **Create a closing mark and read the time on the adjustment disc (1).**
- ❍ **Turn the indicator setting wheel (3) until the closing mark is created directly at the 12.00 p.m. time marking on the adjustment disc.**
- ❍ **If you go past the 12.00 p.m. time marking, repeat the procedure.**
- ❍ **Position the hour hand (5) and minute hand (6) and the relevant washers on the 12.00 p.m. marking and push them down to the stop by hand.**
- ❍ **You can push the second washer (7) down either with the ring or the second hand (7.1).**

Function check

- ✓ Set the clock to 11.00 and close the housing cover.
- ✓ Create the closing mark and compare the time shown with the recorded time.

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For permissible inherent errors please refer to the TPH, TU00.1308.01 000 01, Section 3, Chapter 8.

2.12.7 Modified hands for IVECO version.

! Note

- UV radiation can modify the clock hands on the IVECO version considerably so that these are no longer fixed to the hand support. To correct this error the material used has been modified.
- The new hands have a slightly different colour.
- Replace all hands when the unit needs to be repaired.

From manufacturing number 1789416, the new hands are standard ex works.
For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

2.12.8 Fitting bezel

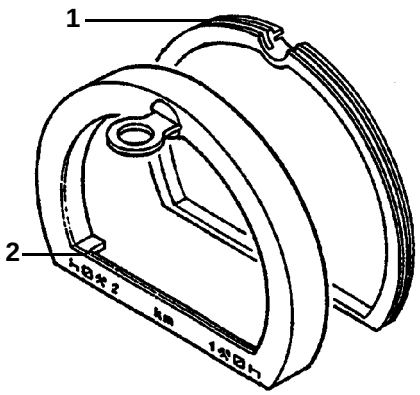

Fig. 2-45 Fitting bezel

1 Panel **2** Bezel

! Note

With RPM units concave plexiglass must be fitted. Flat silicate glass is used with all the other units.

Procedure

- ❍ **Clean the dial with a leather cloth.**
- ❍ **Insert the panel (1) and press the bezel (2) onto the housing cover.**

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2.13 Removing cover plate and knobs

2.13.1 Removing cover plate

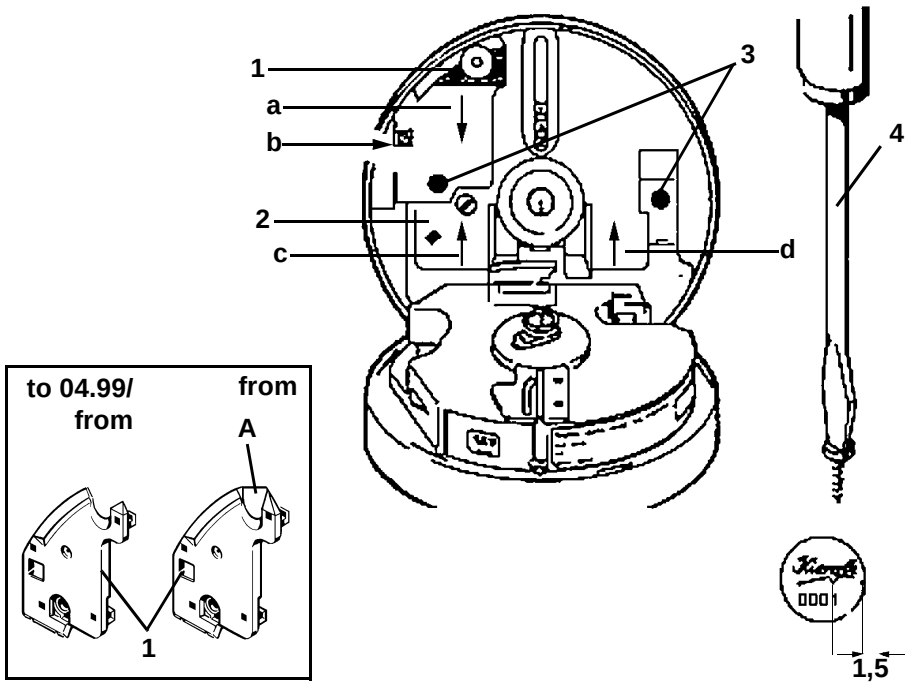

Fig. 2-46 Removing cover plate

1 Coding switch cover
2 Cover plate
3 Seal cap
4 Screwdriver and screw

! Note

From 05.99 the coding switch cover (1) and closure (A) have been standard.
From 12.99 the coding switch cover (1) without closure (A) has been standard.

Both versions are available as replacement parts.

Procedure

- ❍ **Use the screwdriver with soldered on self-tapping screw (B 2.2 x 6.5) to remove the seal caps (3).**
- ❍ **When removing the seal caps (3), support the unit and avoid damaging the brackets on the underside.**
- ❍ **Push the coding switch cover (1) in the direction of the arrow (a).**
- ❍ **Remove the coding switch cover (1).**
- ❍ **Lift the cover plate (2) at position (b) and push it in the direction of the arrow (c).**
- ❍ **Remove the cover plate (2).**
- ❍ **Close the housing cover.**

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2.13.2 Pulling out knobs

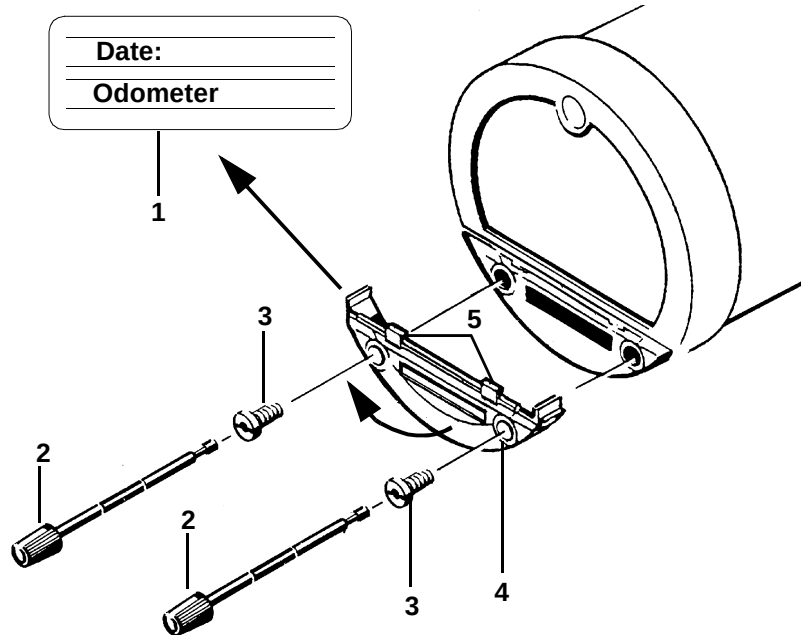

Fig. 2-47 Removing knobs

1 Adhesive label
2 Knobs
3 Screws
4 Cover
5 2 stops

! Note

- Do not remove the cover (4) when the bezel is fitted.

Procedure

- ❍ **Turn the knobs (2) so that they point to the " ⊘ " symbol.**
- ❍ **Remove the knobs (2).**
- ❍ **Undo the screws (3).**
- ❍ **Fold the cover (4) up a maximum 105° in the direction of the arrow.**

The stops (5) hold the cover (4) firmly in place.

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2.14 Distance recorder

Note

Remove the cover plate and knobs prior to repairing the distance counter (see Chapter 2.13).

2.14.1 Setting counter

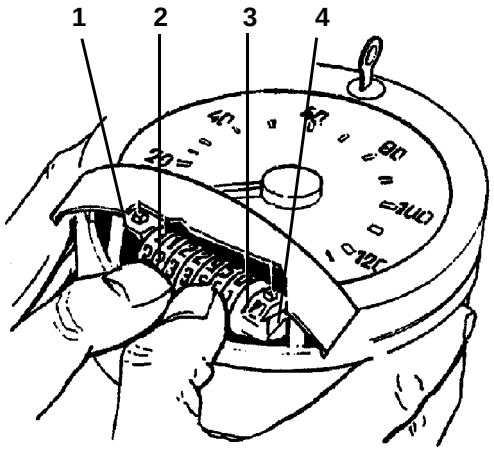

Fig. 2-48 Setting counter

1 Marking
2 Left figure drum
3 Starting drum
4 Marking

Remark

Do not modify the starting drum (3).

Procedure

Turn the figure drums to set the counter.

- ❍ **Start with the left figure drum (2) and hold the drum next to it.**
- ❍ **Proceed in the same way until the desired reading is set.**

Function check

- ✓ The figure drums are aligned.
- ✓ Markings (1) and (4) point to the middle of the figures.

Enter the set reading and date onto the adhesive label (5), Abb. 2-47. Attach the label to the inside of the cover.

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2.14.2 Removing distance counter

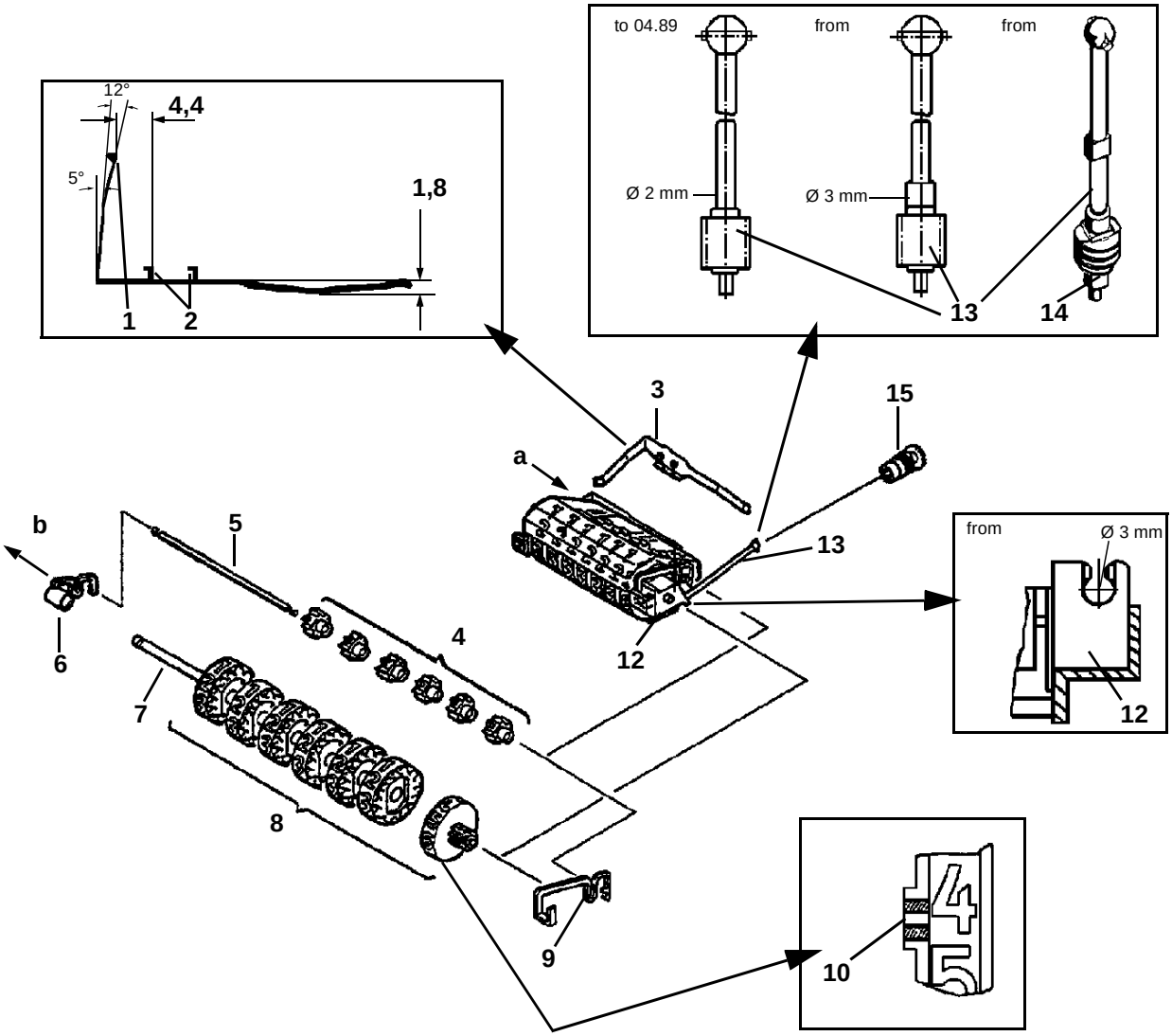

Fig. 2-49 Removing distance counter

1 Spring end
2 Lugs
3 Spring
4 Switching drives
5 Shaft
6 Spring
7 Shaft
8 Figure drums
9 Spring
10 Advancing gear tooth
11 Advancing gear tooth
12 Counter housing
13 Coupling shaft
14 Collar
15 Coupling sleeve

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Remark

- On the KTCO 1318 figure drums (8) the advancing gear tooth (10) is located at figure "4".
- From 07.97 the coupling shaft (13) can be centred in the coupling sleeve and held in the counter housing more easily because of the collar (14).

Procedure

- ❍ **Unhook the spring (3) by pressing on it in the direction of the arrow (a).**
- ❍ **Unhook spring (6) and spring (9) from the shaft (5).**
- ❍ **Remove the shaft (5) and switching drives (4) from the counter housing (12).**
- ❍ **Pull the spring (6) and shaft (7) out in the direction of the arrow (b).**
- ❍ **Replace any defective parts.**

2.14.3 Fitting distance counter

Remark

When fitting the complete distance counter, make sure that the coupling sleeve (15) engages correctly.

Procedure

- ❍ **Put the spring (6) on the shaft (7) until it locks into place.**
- ❍ **Insert the shaft (7) and spring (6) into the counter housing (12) and put the figure drums(8) on.**
- ❍ **Fit the shaft (5) and switching drives (4). When doing this, the shaft (5) ends must firmly lock into the spring (6) on the one side and the counter housing (12) on the other side.**
- ❍ **Insert the spring (9) into the counter housing.**
- ❍ **Hook the spring (9) into shaft (5).**
- ❍ **Fitting the spring (2):**
  Lock the two lugs (3) into the counter housing and press the pre-tensioned spring end (1) against the shaft (7).
- ❍ **Slide the correct coupling shaft (13) into the counter housing (12).**
- ❍ **Check the forward movement.**
- ❍ **Set the counter.**
  (See page 2-53)

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2.15 Fitting cover plate and knobs

2.15.1 Fitting knobs

2.15.1.1 Modified knobs

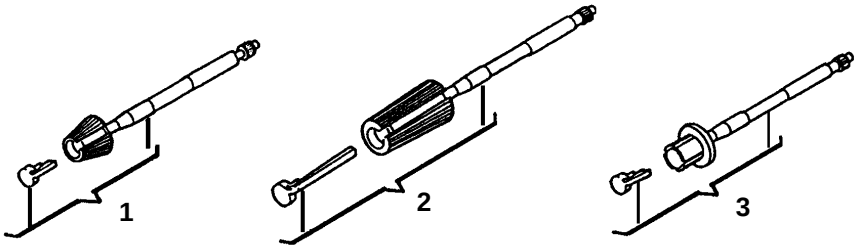

Fig. 2-50 Modified knobs

No.	Description	Length	Version
1	Knob	65.3	
2	Knob	79.4 mm	
2	Knob	70.7 mm	Ford Cargo
3	Knob	65.3 mm	Scania, Kässbohrer

! Note

From 11.94 only pre-assembled knobs are available.
Please note the modified order numbers.

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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2.15.1.2 Inserting knobs

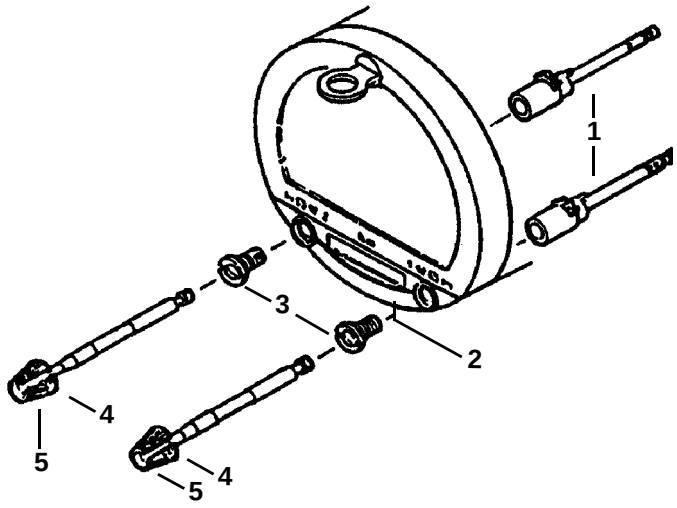

Fig. 2-51 Inserting knobs

1 Spur gear
2 Cover
3 Screws
4 Lug
5 Knobs

! Note

- With CH units the user must not be able to set both knobs to " ⊜ " at the same time.
- Both knobs must clearly indicate the set symbol and lock into place correctly.

Procedure

- ❍ **Fold the cover (2) down.**
- ❍ **Fasten the screws (3).**
- ❍ **Insert the knobs (5) so that " ⊘ " is set.**
  Push the spur gear (1) to the side if necessary.
- ❍ **Lock the moulded lug (4) into place behind the collar of the screw (3).**

Proceed in the same way with CH and driver change units.

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2.15.2 Cover plate versions

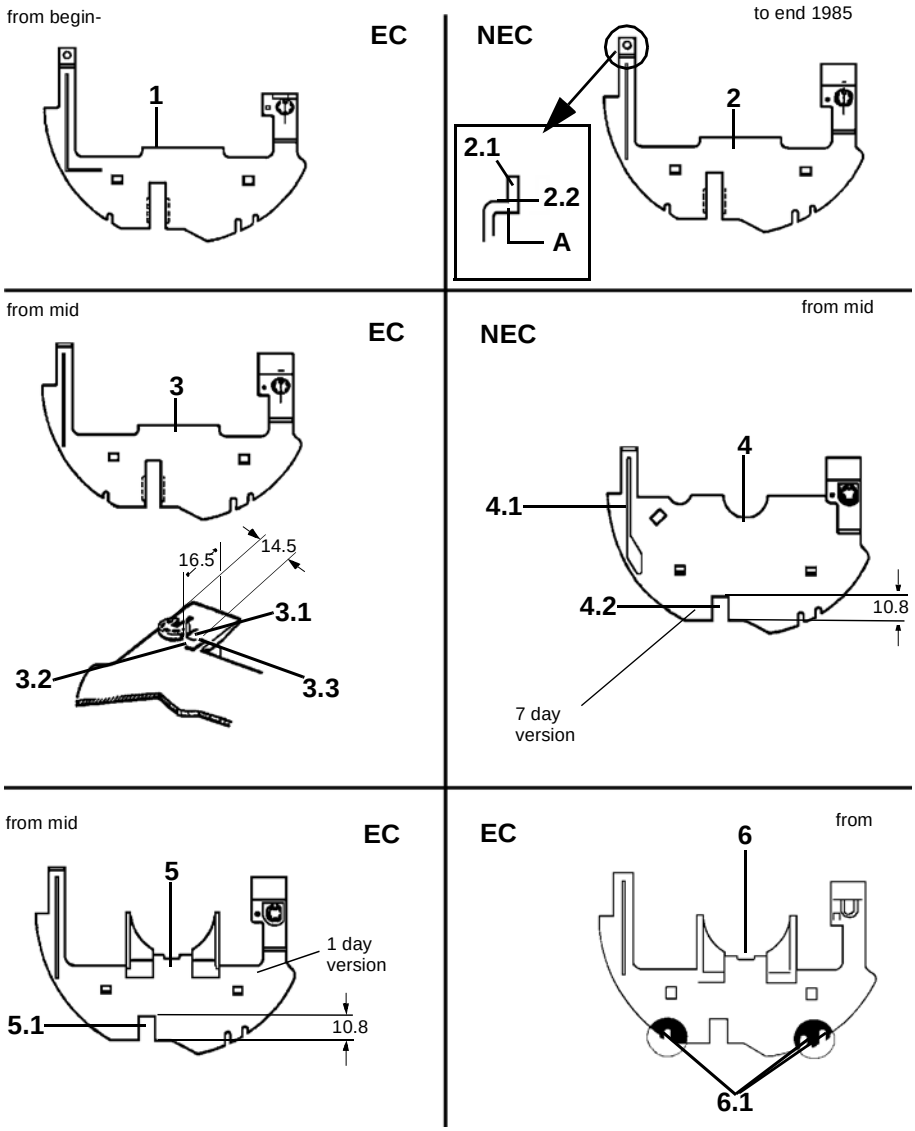

Fig. 2-52 Cover plate versions

1 Cover plate
2 Cover plate
2.1 Lug
2.2 Lug
3 Cover plate
3.1 Catch
3.2 Flat surface
3.3 Flat surface
4 Cover plate
4.1 Chamfer (since 09.92)
4.2 Cover strap cut out (from 02.94)
5 Cover plate
5.1 Cover strap cut out (from 02.94)
6 Cover plate
6.1 Moulded catch

The table below describes how to repair the various cover plates.

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Remark

- The workflow for installing the individual cover plates in the unit is identical.
- Cover plates (3) and (4) have the same order number as cover plate (2).

Cover plate	Device type	used until manuf-acturing number	Repair remarks
1	1318-24...-27 1318-02...-06	about 10.000 approx. begin-ning 1985	• This cover plate must no longer be used.
2	1318-24...-27 1318-02...-06	about 24.000 approx. end 1985	a) Cut off the lug (2.1) at position (a) before installing the cover plate. Push the remaining lug (2.2) in between the SIM seal cup. b) With units before manufacturing number 10.000 the catch (3.1) must be reworked. File off flat surfaces (3.2) and (3.3) to the indicated dimensions, see Abb. 2-52. c) Use the cover plate (4) or (5) if the tachograph chart does not turn smoothly, is damaged or if the flat cable is interrupted.
3	1318-24...-27 1318-02...-06 1318-05...-06	about 127.511 about 124.169 approx. mid 1987	• Repair workflow as described under b) and c) for cover plate (2).
4	7-day unit 1318-05...-06 1318-16	still produced	• Repair workflow as described under c) for cover plate (2) from about 09.92 with chamfer (4.1) from about 02.94 with cover strap cut out 10.8 mm.
5	1-day unit 1318-24...-27 1318-02...-04	still produced	• Repair workflow as described under c) for cover plate (2) from about 02.94 with cover strap (5.1) cut out 10.8 mm.
6	1318-24...-27 1318-01 1318-02 1318-04	Sept. 96	• New lug (6.1) design, can no longer be removed with force. • Fit this cover plate (6) if necessary. • Repair workflow as described under c) for cover plate (2).

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2.15.3 Fitting cover plate

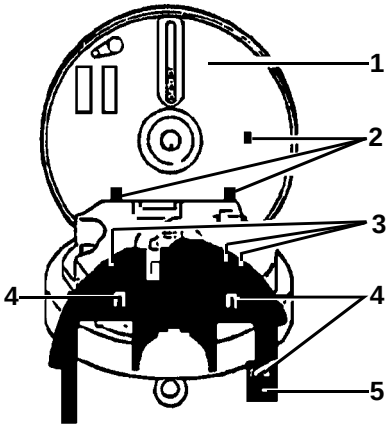

Fig. 2-53 Inserting cover plate

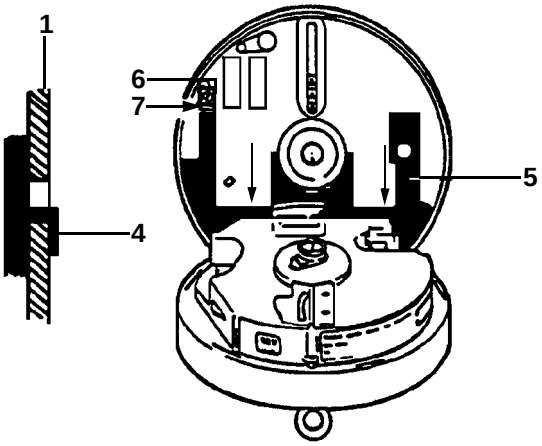

Fig. 2-54 Fitted cover plate

1	Housing	**4**	Catches
2	Recess	**5**	Cover plate
3	Recess	**6**	Seal cup

Remark

- The lug located at (7) must be between the seal cups (6).
- The knobs and counter shaft must be located in the recesses (3).

Procedure

❍ **Insert the cover (5) and catches (4) into the recess (2) on the housing (1) and push it down in the direction of the arrow.**

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2.16 Fitting stylus guide/7-day cutting blade

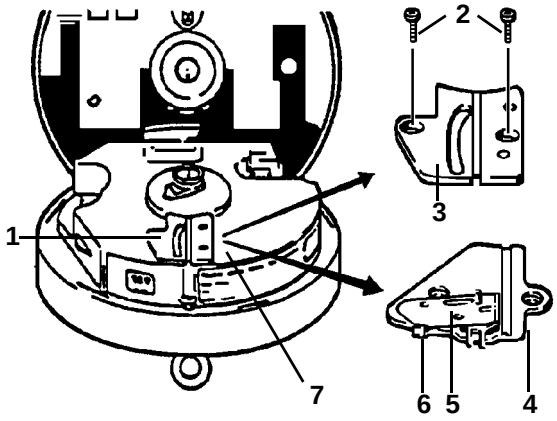

Fig. 2-55 Fitting stylus guide/7-day cutting blade

1 Bonded stylus guide
2 Filister head screws
3 Screwed on stylus guide
4 Cutting blade holder
5 7-day cutting blade
6 Protective nose piece
7 Housing cover

2.16.1 Fitting stylus guide

! Note

- When repairing earlier units, the stylus guide (3) can also be used.
- Remove any adhesive residue before fitting.

From 1987 (manufacturing number 102.000) the stylus guide (1) is screwed to the housing cover (7). The bonded version (3) is no longer available.

Procedure

❍ **Screw the stylus guide (3) to the cover using the filister head screws (2).**

2.16.2 Fitting 7-day cutting blade

Procedure

❍ **With 7-day units replace the stylus guide (1) with the cutting blade holder (4) and fix it with the filister head screws (2).**

❍ **Adjust the 7-day cutting blade (5) in such a way that it is located next to the protective nose piece (6) and about 0.1 mm away from the carrier plate.**

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2.16.3 Modified cutting blade (from 05.99)

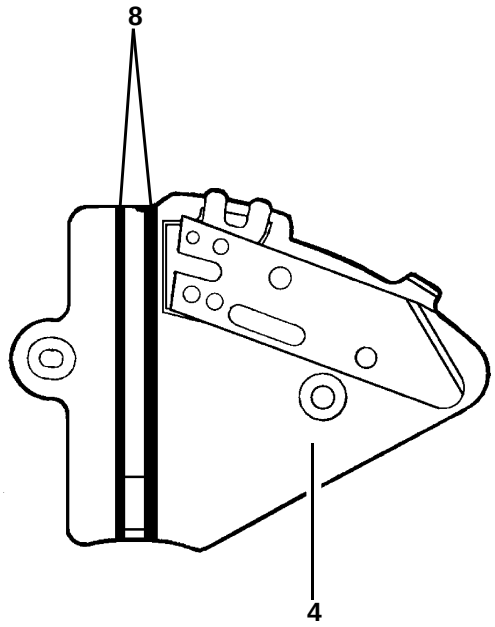

Fig. 2-56 Cutting blade (from 05.99)

4 Cutting blade holder **8** Support strips

Modification

☞ Cutting blade holder (8) with support strips (4).

Remark

- Modification results in better recording quality.
- With some 1318 units (7-day version), 0.6 mm thick flat washers are used with the cutting blade holder (4).
  The flat washers are no longer necessary if a cutting blade holder (4) with support strips (8) is fitted.

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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2.17 Replacing separating plate and cover

2.17.1 Replacing plate on defective covers

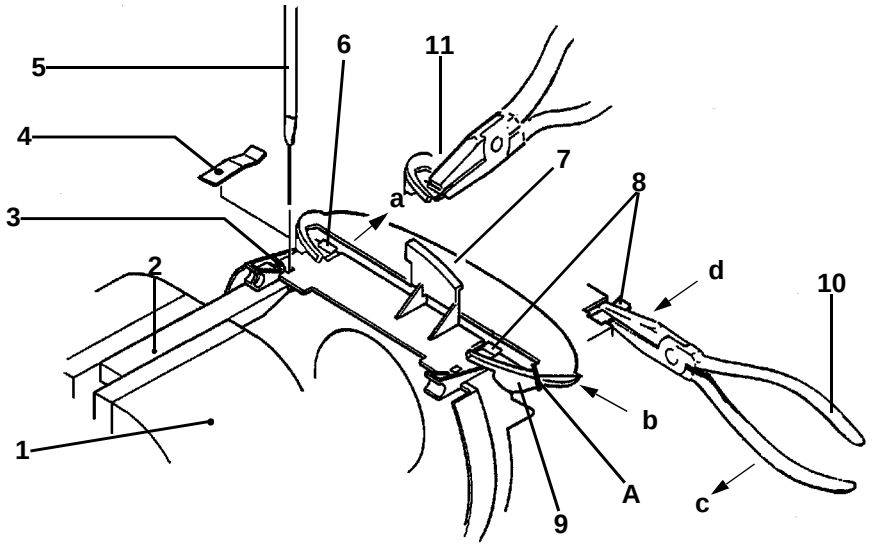

Fig. 2-57 Replacing separating plate

1	Bench vice	**7**	Separating plate
2	Steel bar	**8**	Spring
3	Aperture	**9**	Removed part
4	Catch lug	**10**	Flat-nose pliers
5	Punch	**11**	Pliers
6	Spring		

Procedure

- ❍ **Fasten the steel bar (2) in the bench vice (1).**
- ❍ **Put the cover on in the area of the aperture (3).**
- ❍ **Use the punch (5), Ø = 3 mm, to straighten the catch lug (4).**
- ❍ **Pull the spring (6) out in the direction of the arrow (11) using the pliers (11).**
- ❍ **Remove spring (8) in the same way.**

2.17.2 Replacing defective separating plate

Procedure

- ❍ **Cut off the separating plate (7) at position (A) using a wire cutter.**
- ❍ **Remove the cut off part.**
- ❍ **Push the separating plate (7) out in the direction of the arrow (13).**
- ❍ **Grab the spring part with the flat-nose pliers (10)**
- ❍ **Remove the spring (8) by lifting and pulling it out in the direction of arrow (d).**
- ❍ **Remove the second spring (6) in the same way.**

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2.17.3 Separating plate

Remark

- If you must replace the separating plate as described under 2.17.1, replace springs (6) and (8).
- If you must replace the separating plate as described under 2.17.2, springs (6) and (8) can be reused.
- Push the springs in to the stop in the direction of the arrow (15) using the flat-nose pliers (10).
- Then check whether the separating plate is working correctly.

2.17.4 Secure contact with 318 warning LED (from 05.97)

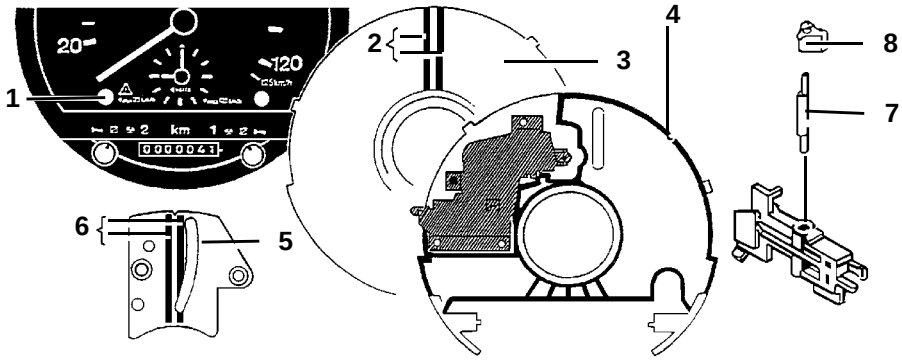

Fig. 2-58 Secure contact with 318 warning LED (from 05.97)

1	Function control LED	**5**	Stylus guide
2	Support strips	**6**	Support strips
3	Separating plate	**7**	Eccentric shaft
4	Collar across full length	**8**	Bearing bracket

Secure contact *Carry out the measures below to solve any problems with the warning LED (1), i.e. LED lights up:*

❍ **Fit the plate with support strips (2) (2-driver).**

— **or** —

❍ **Fit the support (5) with support strips (6) (1-driver).**

— **or** —

❍ **Fit and set the eccentric shaft (7) and bearing bracket (8). (1- and 2-driver)**

For fitting hints please refer to Section 3.6.9.

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2.18 Replacing cover and cover strap

2.18.1 Replacing cover

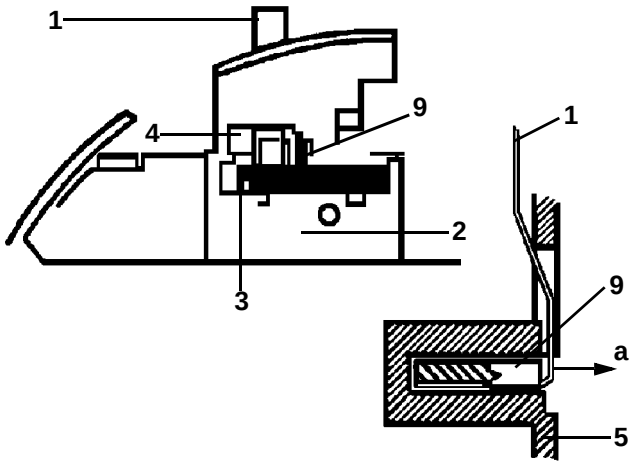

Fig. 2-59 Removing cover strap

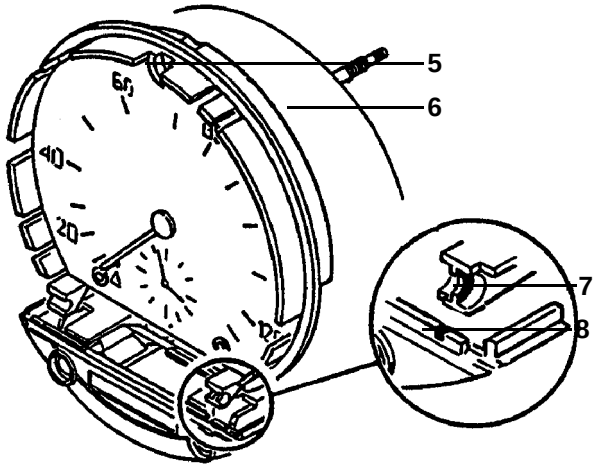

Fig. 2-60 Cover housing

1 Cover strap
2 Cover
3 Strap cover
4 Aperture
5 Cover unit
6 Housing
7 Lug
8 Grooves
9 Cover strap plate

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Remark

- Please note the various cover strap versions and the sizes of the fixings on the cover and housing. See Abb. 2-62 and Abb. 2-63.
- When attaching the cover unit (5) to the housing (6), Abb. 2-60, please make sure that the lug (7) goes into the groove (8).
- The strap cover (3) is not necessary if the cover strap plate (9) must be pressed into the cover unit (5). Fit the strap cover (3) if these parts are joined together.

Procedure

- ❍ **Remove all components and parts from the housing cover.**
- ❍ **Slide a small screwdriver under the cover strap plate (9).**
- ❍ **Push the strap cover (3) in the direction of the arrow (a) and remove it.**
- ❍ **Pull the cover strap (1) out in the direction of the arrow (a) and push it through the aperture (4).**
- ❍ **Replace the cover and fit the various components again.**
- ❍ **Join the cover unit together.**
- ❍ **Hook the cover strap (1) in and protect it with the cover (2).**
- ❍ **Close the cover**
- ❍ **Clean the dial components.**
- ❍ **Fit the bezel.**

2.18.2 Modified cover dimensions (from 01.96)

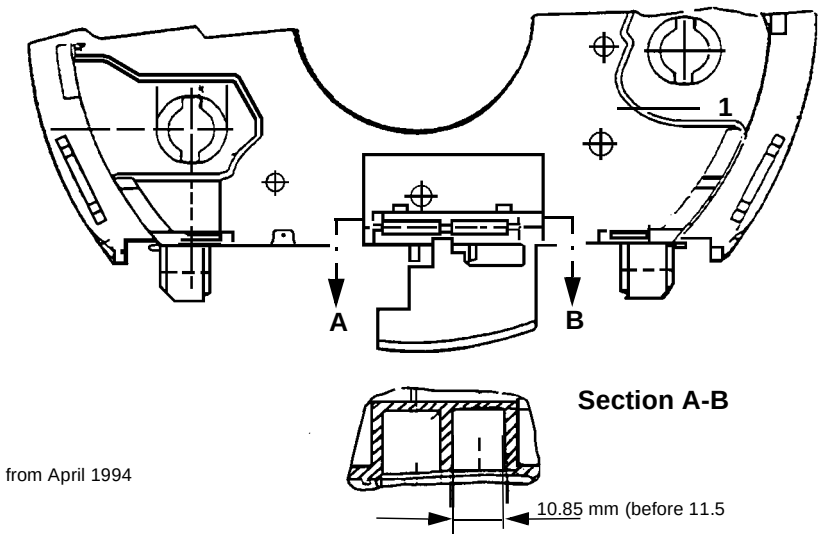

Fig. 2-61 Modified cover unit dimensions

1 Cover unit

Modification

☞ Cover unit dimension modified from 11.5 mm to 10.85 mm.

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2.18.3 Replacing cover strap

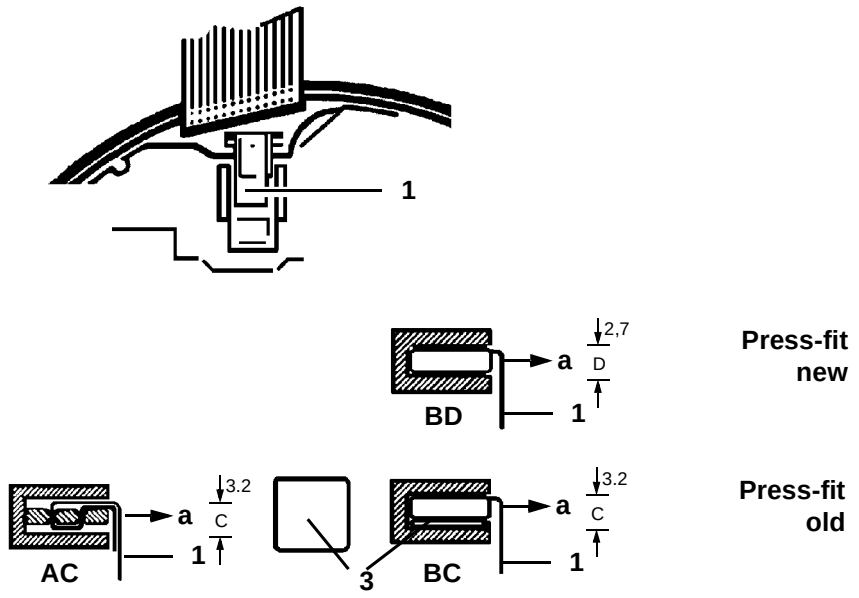

Fig. 2-62 Fastening cover strap to housing

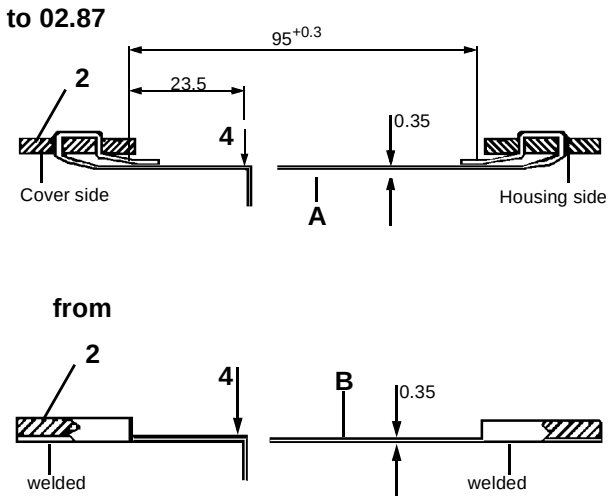

Fig. 2-63 Cover strap version

1 Cover strap
2 Cover side
3 Small plates
4 Kinked cover strap

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Remark

- "AC" old press-fit version: with threaded cover strap "A" and housing or cover with 3.2 mm fixing "C".
- "CC" old press-fit version: with threaded cover strap "B" and housing or cover with 3.2 mm fixing "C".
- "BD" new press-fit version: with threaded cover strap "B" and housing or cover with 2.7 mm fixing "D".

Procedure

The cover strap (1) is hooked into a special fixing on the housing.

❍ **Remove the v board, n board and complete frame from the housing.**

See Chapter 3.4.

❍ **Pull the cover strap (1) out in the direction of the arrow (a).**

❍ **Remove the strap cover Abb. 2-59, item (3).**

❍ **Pull the cover strap (1) out of the housing.**

Note

On the cover side (2) the cover strap (1) is bent at position (4).
This makes opening and closing the cover easier.

❍ **Please note the dimensions when threading version "A" straps. (See Abb. 2-63)**

Only version "B" is available as a replacement part.

❍ **In case of repairs, insert the small plates "BC" (3).**

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Section 3 Removing and fitting housing

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3 Contents and assignment

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Key

- \- **not available**
- ◦ **optional**
- • **illustration available**
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Key

- \- **not available**
- o **optional**
- • **illustration available**
- * **additional equipment "01" only**
- ** **discontinued**

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Key

- \- **not available**
- o **optional**
- • **illustration available**
- * **additional equipment "01" only**
- ** **discontinued**

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Key

- \- **not available**
- o **optional**
- • **illustration available**
- * **additional equipment "01" only**
- ** **discontinued**

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3.1 Housing – overall view

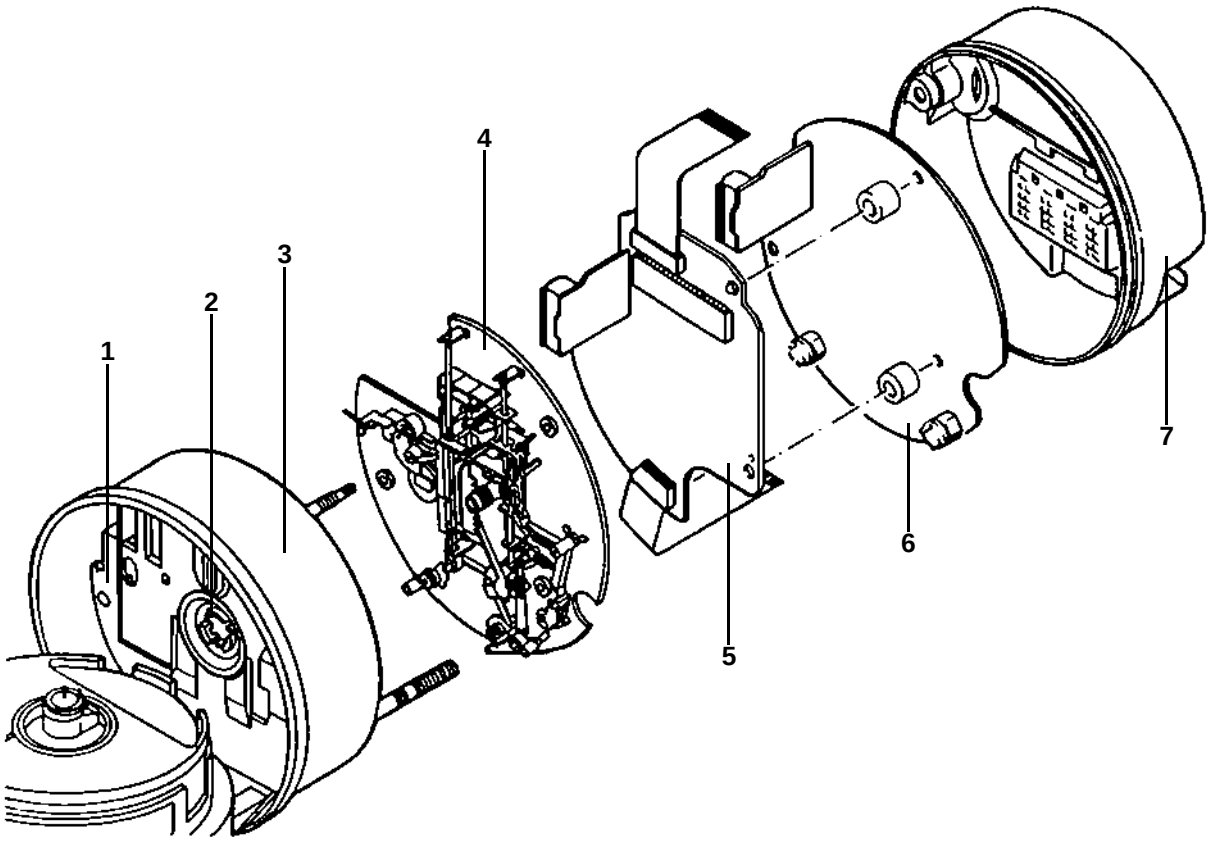

Fig. 3-1 Housing – overall view

1 Cover plate
2 Tensioning knob
3 Housing
4 Complete frame
5 n board with coding plate
6 n board with coding plate
7 Hood

! Note

Removing the cover plate (1) is described in Chapter2.13.1.

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3.2 Removing hood

3.2.1 Inserting removal tool

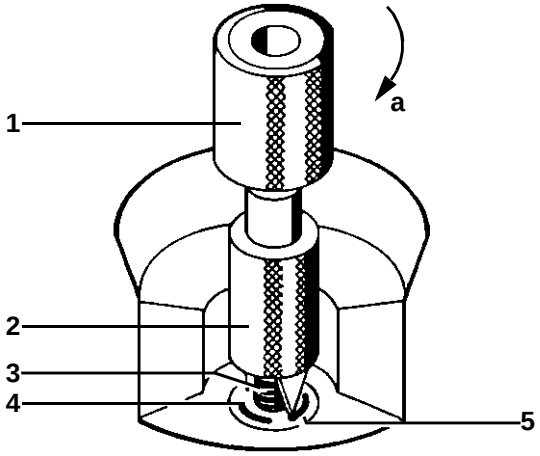

Fig. 3-2 Inserting removal tool

1 Fitting tool
2 Removal tool
3 Threaded pin
4 Protective cap
5 Kidney shaped aperture

! Note

Do not cause any damage when using a device near the threaded pin (3).

3.2.2 Fixing cap versions

= Factory fixing cap

= Service fixing cap

From 01.99:
colour changed from red to

Fig. 3-3 Fixing cap versions

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3.2.3 Removing fixing cap

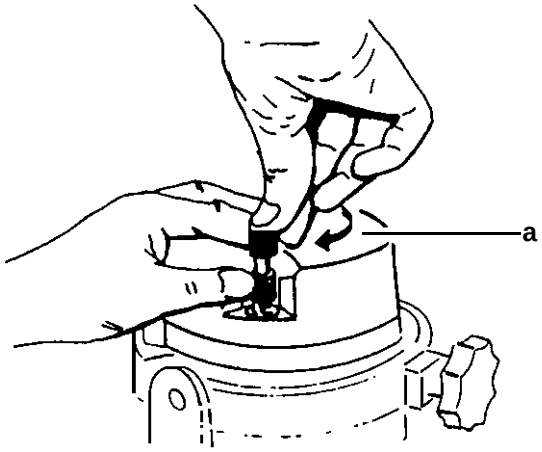

Fig. 3-4 Removing fixing cap

Procedure

- ❍ **Slide the removal tool (1) over the threaded pin (3).**
- ❍ **Turn the tool (1) in the direction of the arrow (a) until the wedge-shaped cuts go past the fixing cap lugs.**

You will hear 2 clicks.

- ❍ **Remove the second fixing cap in the same way.**

3.2.4 Removing hood

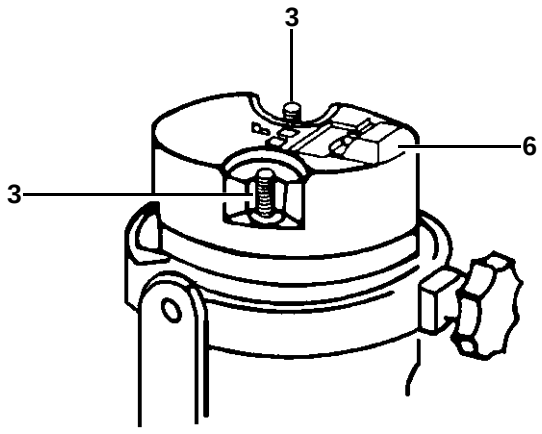

Fig. 3-5 Removing hood

Procedure

- ❍ **Remove the hood (6) carefully.**

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3.3 Removing socket housing

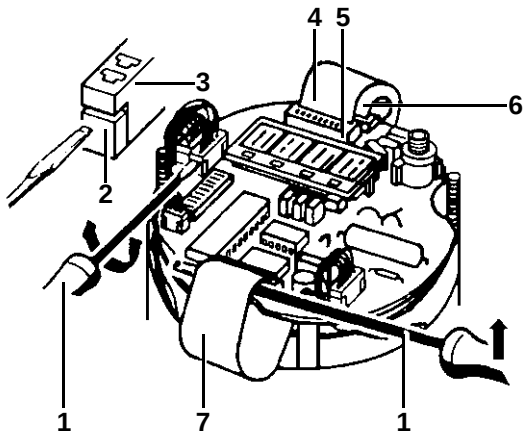

Fig. 3-6 Removing socket housing

1 Screwdriver
2 Socket connector
3 Socket housing
4 Flat cable
5 Socket connector
6 Flat cable
7 Flat cable*

! Note

Use anti-static protective sleeves to store and transport v boards.

*Flat cable (7) not needed with µP units

Procedure

- ❍ **Remove the socket housing (3).**
  To do this, insert the screwdriver (1) between the socket housing (3) and the socket connector (2) and remove by rotating the socket housing.
- ❍ **Pull the flat cable (4) out of the socket connector (5).**

With RPM units also remove flat cables (6) and (7).
If necessary use a screwdriver (1).

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3.4 Removing trough connector/ plug unit / lug

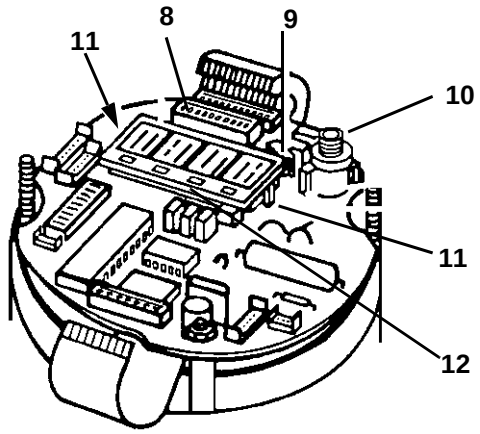

Fig. 3-7 Removing trough connector, lug, plug units

8 Socket connector
9 Lug
10 Opto interface
11 Plug
12 Trough connector

! Note

From 02.94 the plug unit (10) and the trough connector (12) have been incorporated into the hood.
(See Chapter 3.16.9.2)

Procedure

- **Using a screwdriver unhook the catch lugs (11) and pull the trough connector (12) upwards to remove it.**
- **Using a screwdriver slide the lug that is secured by paint from the motor drive shaft.**

— or —

- **Remove the lug (9) fixed with a clip with tweezers.**
- **Remove the plug unit/ data output (10).**
- **Disengage the plug catch lugs (11) and remove the plug.**

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3.5 v/ n board identification

Model	Board	Board versions	Technical level of the v/ n boards		
			Flat cable 16 pin	Flat cable 8 pin	Date introduced
1318	**-XX**	**-XXX**	**-XX**		
	.9999 no longer available	.1xx = EC;ASIC	03		no longer available
	.89 **Service board (with potentiometers)**	.2xx = NEC;ASIC	04	54	11.94
	.72 Series board (without potentiometers)	.4xx = EC;EMC	05	55	10.95
	.71 Layout board (without assembly components)	.7xx = NEC;EMC	10	60	04.96
		8xx = µP **800 - 849 = EC** **850 - 882 = NEC**	11 **12**	61 **62**	03.97 **03.98**
RPM units					
1318	**-89**	**-XXX**	**-XX**		
		.3xx = not µP	xx		**in 12V; 24V and STB**
		.900.03 = µP	04 10 11 12		**for 12V and 24V; STB on v board**

! Note

To identify (older) v or n board versions please refer to Service Informationt **112** 080 / 094 / 106 / 120 / 125.

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3.6 v board

3.6.1 Removing v board

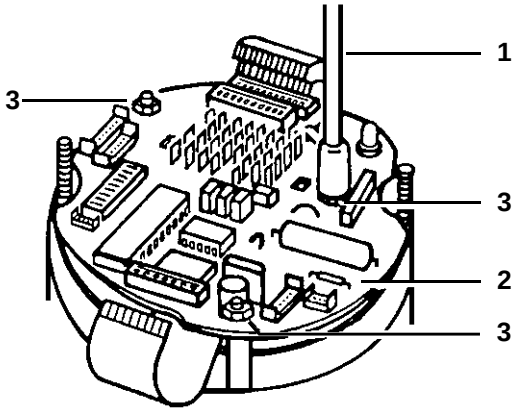

Fig. 3-8 Removing v board

1 SW 5.5mm socket spanner
2 v board
3 M3 nuts

- **Using an SW 5.5mm socket spanner (1) remove the nuts (3).**
- **Remove the v board (2) carefully.**

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3.6.2 Replacing v board coding plate

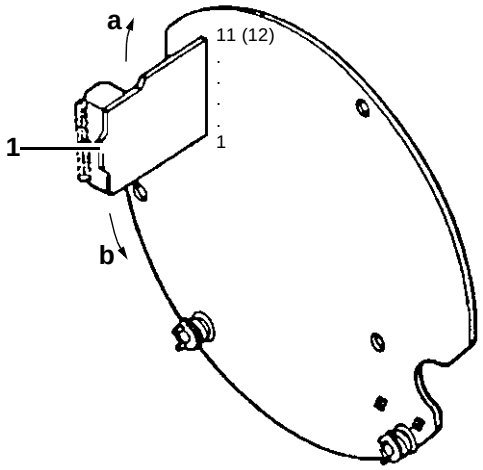

Fig. 3-9 Replacing coding plate

1 Coding plate

Remark

- When doing this note the 11 or 12 pin design and the details 1...11 or 1...12 on the v board and the coding plate.
- If necessary remove pin 12 from the coding plate.

Modified since 03.91

☞ Coding plate changed from 12 pin to 11 pin.

Procedure

❍ **Fix the v board onto the outside edge.**

❍ **Tilt the coding plate (1) slightly in the direction of the arrows (a) and (b) and at the same time slide it out of the support.**

❍ **Insert a new coding plate (1).**

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3.6.3 Series v board converted into a service version (until 10.91)

Note

NO µP version.

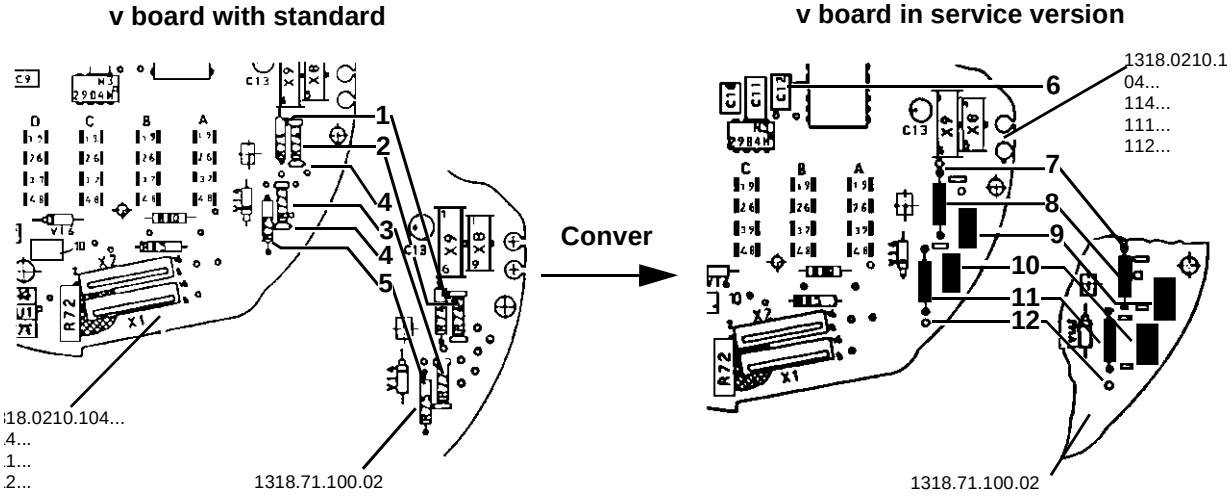

Fig. 3-10 Series v board converted into a service version (until 10.91)

1 Resistor
2 Resistor
3 Resistor
4 Soldering points
5 Resistor
6 Condenser
7 Drilled hole
8 Resistor
9 Potentiometer
10 Potentiometer
11 Resistor
12 Drilled hole

Remark

Drilled holes (7) and (12) must remain free.

Procedure

- **Unsolder resistors (1), (2), (3) and (5) and soldering points (4).**
- **At positions (8) and (11) solder resistors, R = 1KΩ, and at 180 km/h resistors KN53.0291.080, R = 620Ω.**
- **At positions (9) and (10) solder potentiometer HW11.461, R = 10KΩ, 0.5 W.**

3.6.4 Converting v board for 140 km/h (up to approx. 03.91)

Procedure

- **Unsolder condenser (6), C = 0.47 µF/50 V.**
- **Solder new KN53.1140.577 condensor, C = 1 µF/63 V to position (6)**

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3.6.5 Converting series v board into service version (until 03.93)

! Note

- **NO µP version.**
- Service version 1318.89.4xx.01, .04 and .7xx.01, .04.

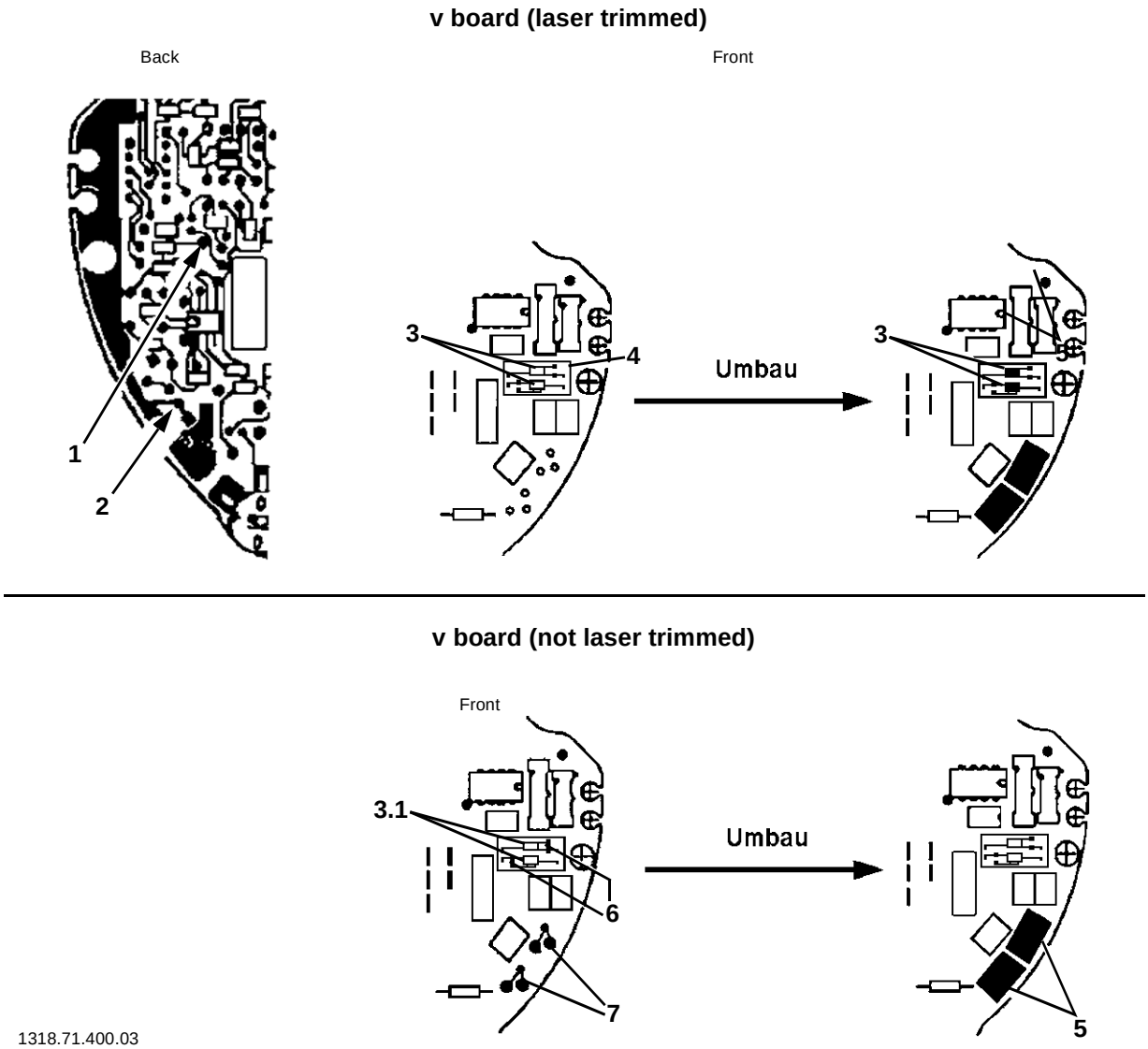

Fig. 3-11 Converting series v board into service version (until 03.93)

1 Conductor
2 Conductor
3 SMD balancing resistors
3.1 SMD resistors
4 Laser-trimmed plates
5 Potentiometer
6 Solder bridges
7 Resistors

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3.6.5.1 v board with laser-trimmed SMD resistors

Identification *EMC improved design in 4 multilayer positions with laser-trimmed plates (4) and SMD balancing resistors (3).*

Procedure

- ❍ **Unsolder SMD balancing resistors (3).**
- ❍ **Solder non-balanced SMD resistors KN53.0272.301, R = 750Ω - 30%, to position (3).**
- ❍ **Solder potentiometer (5) HW11.461, R = 10 KOhm.**

Remark

Do not damage conductors.

- ❍ **Using a knife disconnect the connectors to the left and right of positions (1) and (2)**
  .
- ❍ **Using a screwdriver scrape off points at positions (1) and (2).**

—— **or** ——

3.6.5.2 v board without laser-trimmed SMD resistors

Remark

Standard substitute balancing for faults with laser units.

Identification *SMD resistors (3.1), traditional resistors (7), closed soldering points (6) and conductors cut through at positions (1) and (2).*

Procedure

- ❍ **Unsolder resistors (7).**
- ❍ **Solder potentiometer (5) HW11.461, R = 10 KΩ.**
- ❍ **Open solder bridges (6).**

In this version the conductors in positions (1) and (2) are cut through.

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3.6.6 Converting a series v board into a service version (until 10.94)

Note

- **NO µP version.**
- Service version 1318.89.4xx.11 and .89.7xx.11.
- Balancing is done as standard with three SMD resistors (1) that are soldered directly to the v board (without laser trimmed plates).

1318.71.400.11
1318.71.400.12

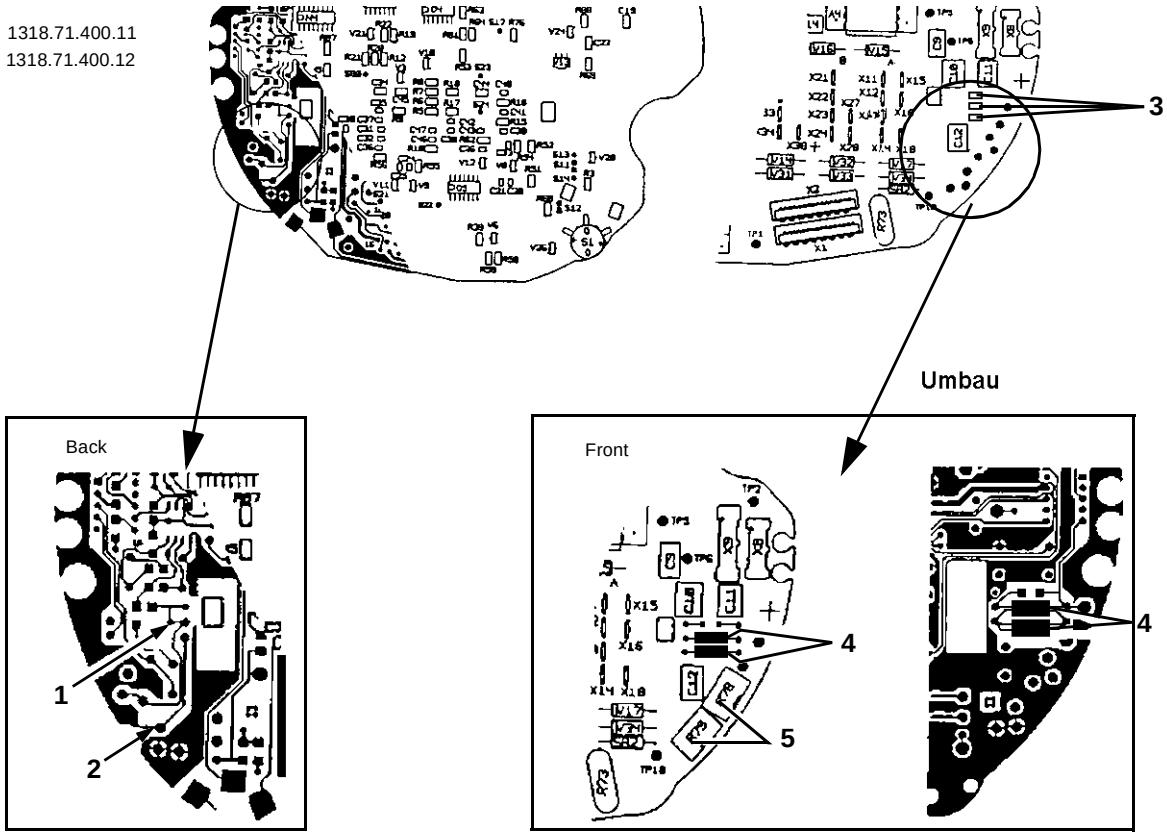

Fig. 3-12 Converting a series v board into a service version (until 10.94)

1 Conductor
2 Conductor
3 SMD resistors
4 Resistors
5 Potentiometer

Remark

Do not damage conductors.

Procedure

- ❍ **Unsolder SMD resistors (1).**
- ❍ **Solder two traditional resistors (2) KN53.0291.080, R = 620Ω.**
- ❍ **Solder potentiometer (3) HW11.461, R = 10 KΩ.**
- ❍ **Disconnect connectors at positions (4) and (5).**

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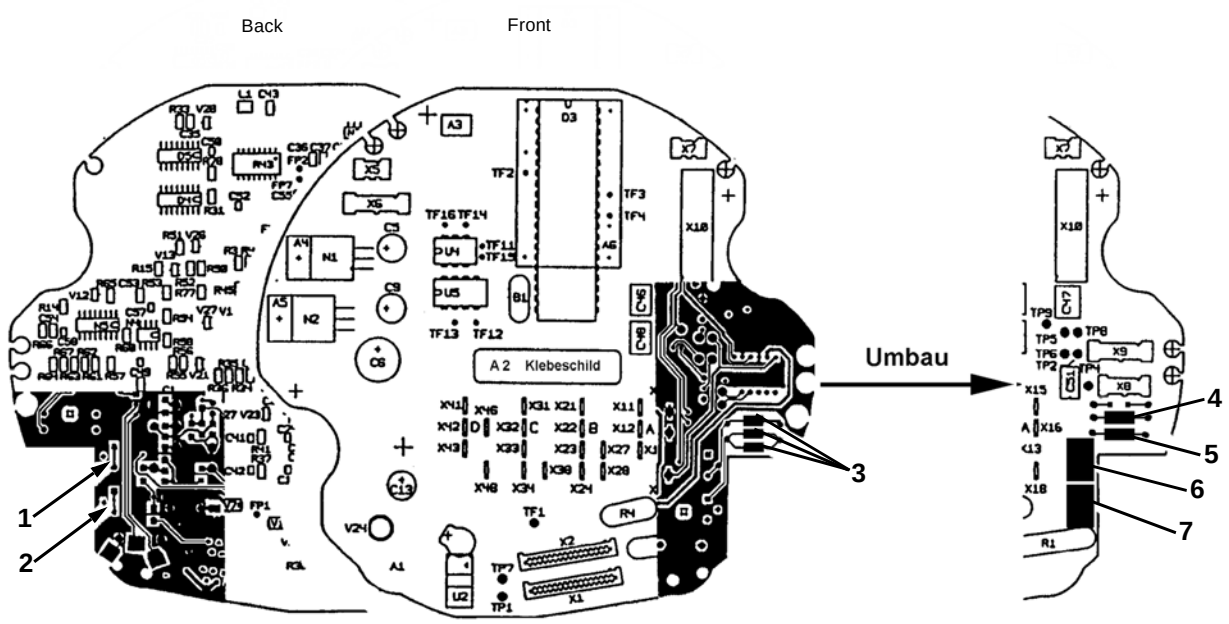
3.6.7 Converting a series µP v board into a service version (from 11.94)

Note

v board in µP version



1318.71.800.10

Fig. 3-13 Converting a series µP v board into a service version (from 11.94)

1 Conductor
2 Conductor
3 SMD resistors
4 Resistor
5 Resistor
6 Potentiometer
7 Potentiometer

Remark

- Fit the hood with integral trough connector and plug to the µP units (see Chapter 3.16.9.2).
- Do not damage conductors.

Procedure

- ❍ **Unsolder balanced SMD resistors (3).**
- ❍ **Solder resistors KN53.0291.080, R=620 Ω/0.4W to positions (4) and (5).**
- ❍ **Solder potentiometer HW11.461, R=10 KΩ/0.5 Watt to positions (6) and (7).**
- ❍ **Disconnect connectors at positions (1) and (2).**

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3.7 n board

3.7.1 Removing n board

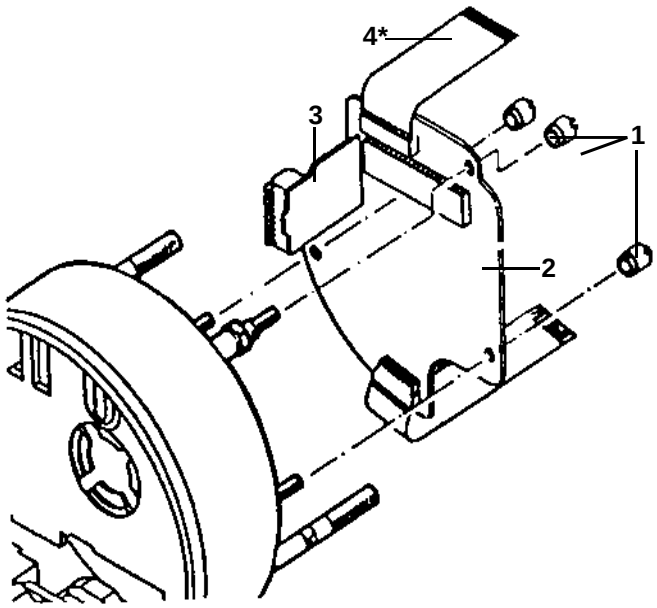

Fig. 3-14 Removing n board

1 Spacer
2 n board
3 Coding plate
4 Flat cable *

! Note

When removing the n board (2) do not damage the coding plate (3).

*not necessary with µP versions

Procedure

- ❍ **Remove v board.**
- ❍ **Remove the spacer (1).**
- ❍ **Remove n board (2).**

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3.7.2 Converting series n board into a service version

Note

NO µP version.

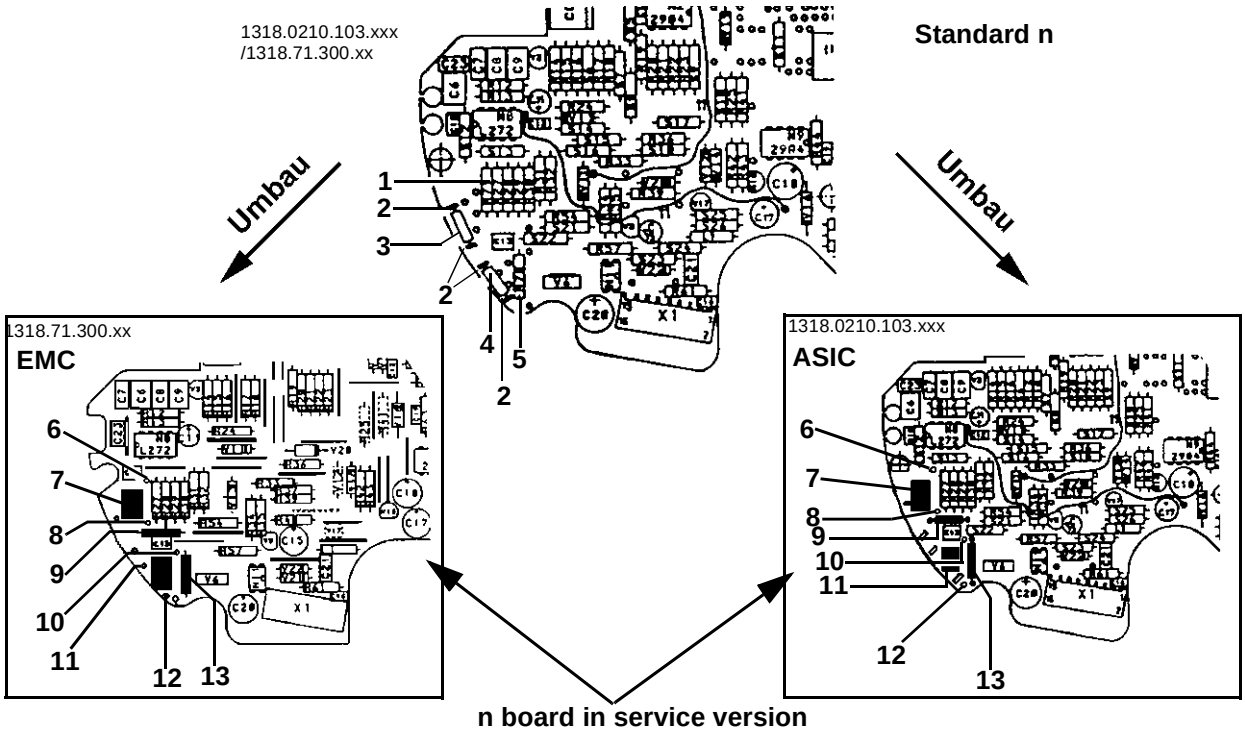

Fig. 3-15 Converting standardn board to service version

1 Resistor
2 Soldering points
3 Resistor
4 Resistor
5 Resistor
6 Drilled hole
7 Potentiometer
8 Drilled hole
9 Resistor
10 Drilled hole
11 Potentiometer
12 Drilled hole
13 Resistor

Remark

- Make a note of the correct assembly.
- Drilled holes (6), (8), (10) and (12) must remain free.

Procedure

- ❍ **Unsolder resistors (1), (3), (3) and (5) and if necessary soldering points (2).**
- ❍ **Solder resistors KN53.0291.101, R= 1 KΩ to positions (9) and (13).**
- ❍ **Solder potentiometer HW11.486, R = 20KΩ0.5 W to positions (7) and (11).**

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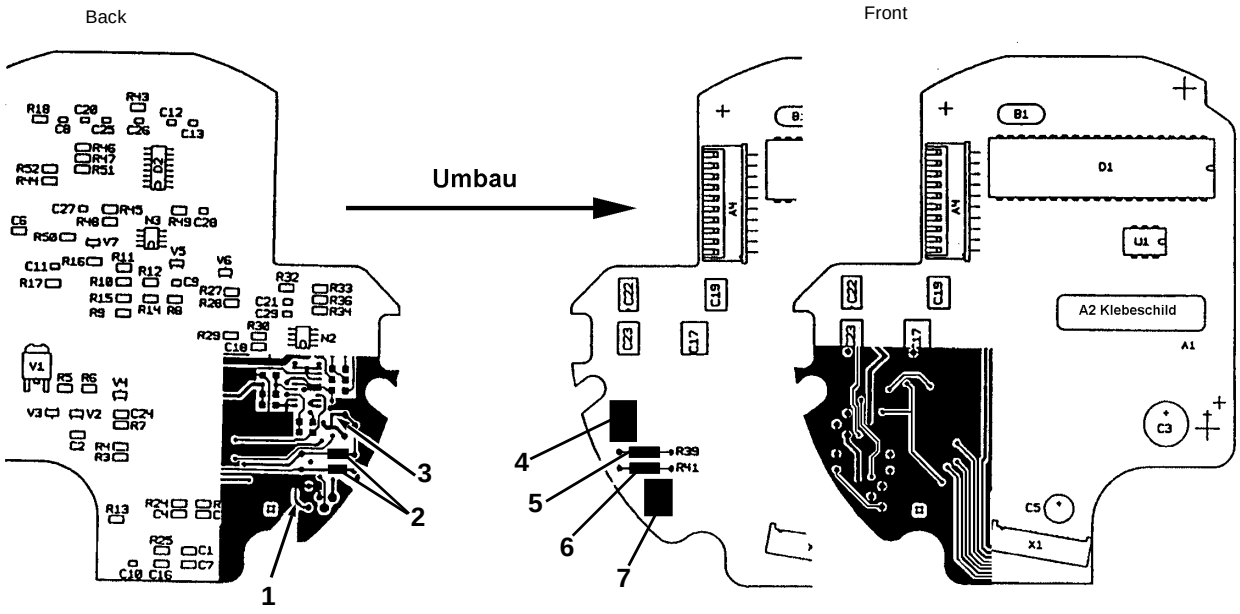
3.7.3 Converting a series µP v board into a service version (from 11.94)

Note

n board in µP version



1318.71.900.10

Fig. 3-16 Converting series µP n board into a service version

1 Conductor
2 SMD resistors
3 Conductor
4 Potentiometer
5 Resistor
6 Resistor
7 Potentiometer

Note

Do not damage conductors.

Procedure

- **Unsolder two balanced SMD resistors (2).**
- **Disconnect connectors at positions (1) and (3).**
- **Solder two potentiometer resistors HW11.461, R = 10 KΩ to positions (4) and (7).**
- **Solder resistors KN53.0291.080, R=620 Ω/0.4 W to positions (5) and (6).**

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3.8 Removing frame

3.8.1 Removing frame completely

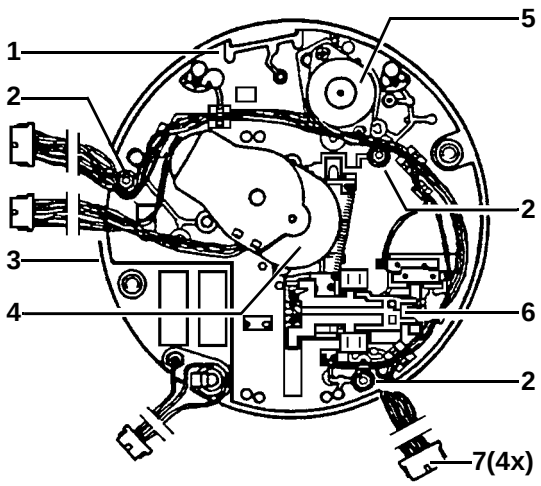

Fig. 3-17 Removing frame completely

1 Complete frame
2 Hexagonal nuts
3 Housing
4 Speed measuring system
5 Distance/ WT motor
6 Rocker for warning device
7 Ultrex connector (socket housing)

Procedure

- ❍ **Remove the hexagonal nuts (2) with an SW = 7 mm socket spanner.**
- ❍ **Lift the whole frame (1) out of the housing.**

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3.8.2 Removing v contact carrier

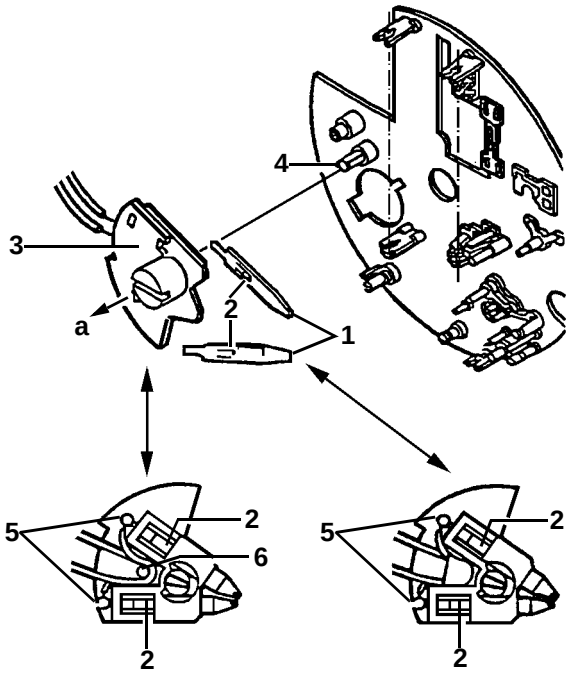

Fig. 3-18 Contact carrier

1 Contact springs
2 Catch lugs
3 Contact carrier
4 Frame stud
5 Wires

Remark

Ensure the wires are laid carefully (no strain).

Procedure

- **Remove the contact carrier (3) from the frame stud (4) in the direction of the arrow (a).**

Replacing the contact springs (1)

- **Unsolder the wires (5).**
- **Disengage the catch lugs (4) and remove the contact springs (1).**
- **Push the new contact springs (1) into the contact carriers (2) until the catch lugs (4) engage.**
- **Solder the wires (5).**

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3.8.3 Removing stylus unit

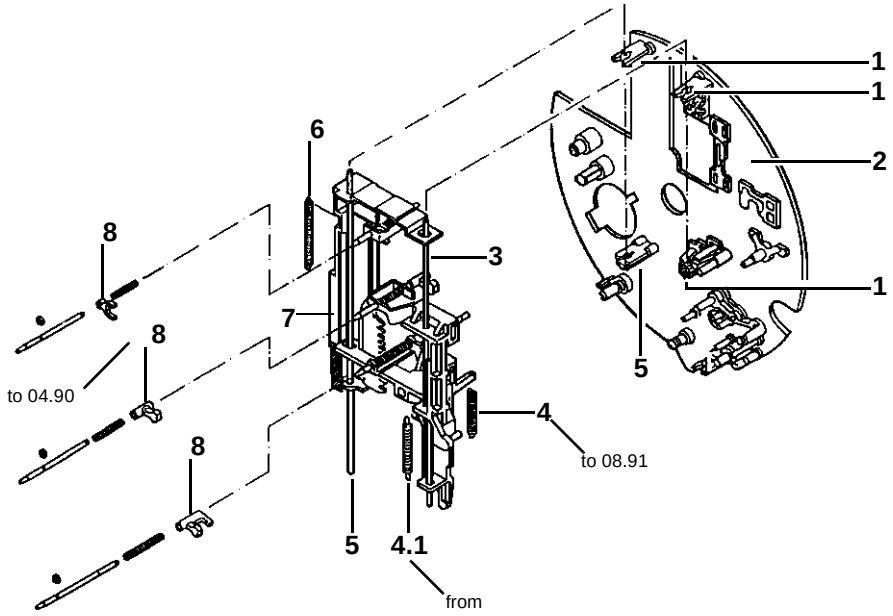

Fig. 3-19 Removing stylus unit

1 Frame bracket
2 Frame
3 Guide rod, short
4 Tension spring for distance carriage
4.1 Tension spring for distance carriage
5 Guide rod, long
6 Tension spring for v carriage
7 Contact path
8 Anti-twist device

Remark

- The respective stylus holder is firmly bonded to the carriage.
- Should the bonding be loose replace the whole stylus carriage.
- Do not touch the contact path (7). If you do clean and polish it.

Procedure

- ❍ **Unhook the tension spring (4) (0.25 x 3 x 17) on the back of the frame (2) or tension spring (4.1) (0.25 x 3 x 15.3).**
- ❍ **Unhook the tension spring (6).**
- ❍ **Lift the guide rod (5) out of the frame bracket (1).**
- ❍ **Lift guide rod (3) out of the bracket(1).**
- ❍ **Lift out the complete stylus unit.**

When doing this, mind the anti-twist devices (8).

- ❍ **Remove guide rods (3) and (5).**
- ❍ **Replace the stylus carriage.**

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3.8.3.1 Modified distance stylus (from 02.00)

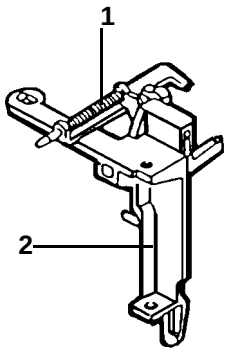

Fig. 3-20 Distance stylus (from 02.00)

1 Pressure spring
2 Distance stylus

Modification from 02.00

☞ Copper coloured pressure spring (1) in distance stylus (2) modified.

This has been standard from manufacturing number 3.338.525.
The order number for the distance stylus (2) remains unchanged.

3.8.3.2 Modifications to the v, distance and WT carriages (from 03.97)

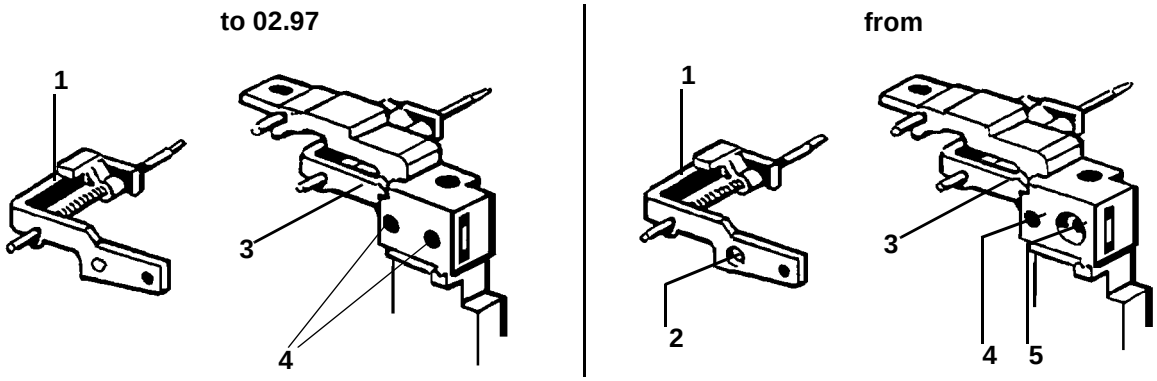

Fig. 3-21 v, distance and WT carriages (from 04.97)

1 Stylus holder
2 Drilled hole
3 v carriage
4 Adhesive holes
5 Intake guide

Modified since 03.97

☞ Adhesive holes (4) on v carriages were enlarged.

☞ Intake guide (5) modified.

☞ Drilled hole (2) on stylus holder (1) added.

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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3.8.4 Fitting on 2 driver unit

3.8.4.1 Fitting/ removing drive parts for driver 2

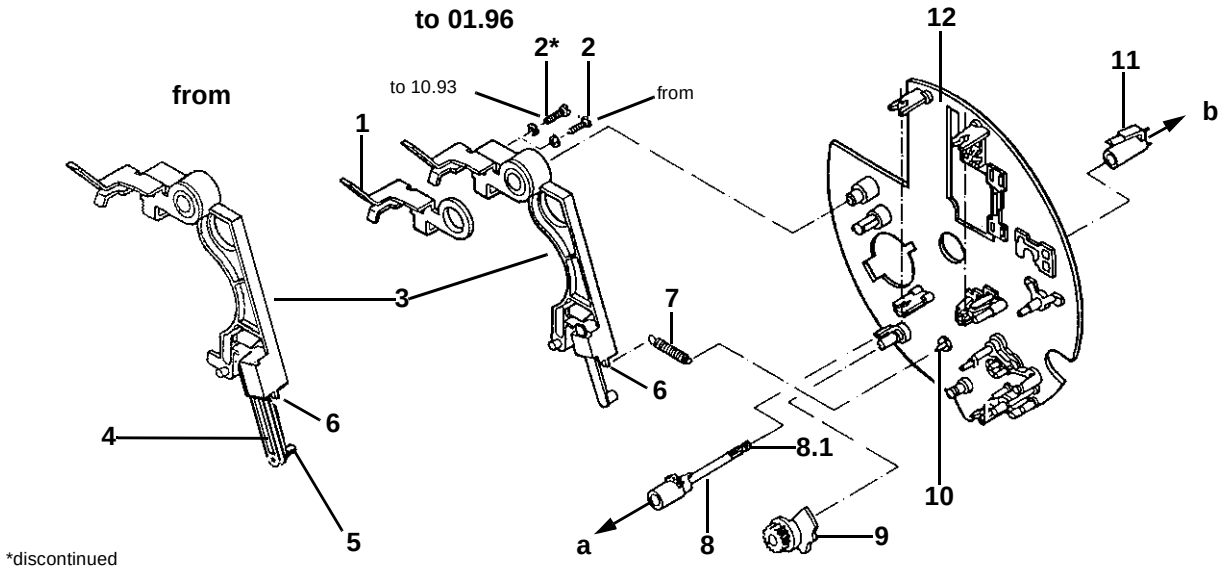

Fig. 3-22 Fitting/ removing drive parts for driver 2

1 Coupling lever
2 Screw
3 Lever complete
4 Lever
5 Tracing finger
6 Lever lug
7 Tension spring
8 Spur gear
8.1 Front of spur gear
9 Connecting link
10 Frame stud
11 Stop springs
12 Frame plate

Remark

With some units the spur gear (8) is welded to the front (8.1) with the stop spring (11). If necessary release them and replace both parts.

Modified since 02.96

☞ The lever (4) and tracing finger (5) moulded to the complete lever (3).

Procedure

- ❍ **Unhook the tension spring (7) and remove the 2 driver lever (3).**
- ❍ **If necessary release the coupling lever (1) after loosening the screw (2).**
- ❍ **Remove the spur gear (8) from the frame plate in the direction of arrow (a) and at the same time remove the stop spring (11) in the direction of arrow (b).**
- ❍ **Remove the connecting link (9).**

Fit the lever

- ❍ **Put the complete lever (3) onto the frame.**
- ❍ **Hook the tension spring (7) onto the lever lug (6) and the frame stud (10).**

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3.8.4.2 Fitting the connection link, spur gear and stop spring for driver 2

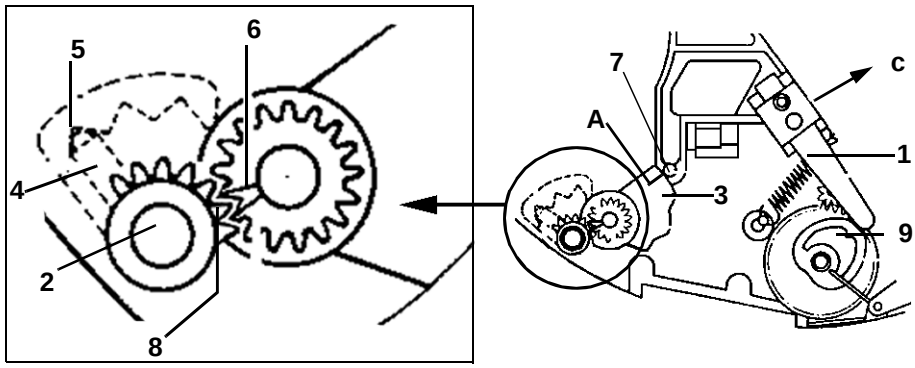

Fig. 3-23 Fitting connecting link, spur gear and stop spring

1 2 driver lever
2 Spur gear
3 Connecting link
4 Stop springs
5 Lock in position
6 Marking
7 Pin
8 2nd Gear tooth
9 Eccentric

! Note

- If the stop spring (4) does **not** snap in when pressed onto the spur gear (2) use a new part.
- Set and check all three locking options.

Procedure

- ❍ **Put the connecting link (3) on in such a way that the pin (7) is flush with position (A).**
- ❍ **Insert the spur gear (2) in such a way that the 2nd tooth (8) is opposite the marking (6).**
- ❍ **In this position press the spur gear (2) downwards.**
- ❍ **On the back of the frame press the stop spring (4) so that it engages into the locking position (5).**

Checking lever play

- ✓ If the lever (1) is at the highest position of the eccentric (9), as in Fig. 3-23 and the connecting link (3) takes up the position illustrated there must be play in the direction of the arrow (c).

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3.8.5 Removing and installing gears

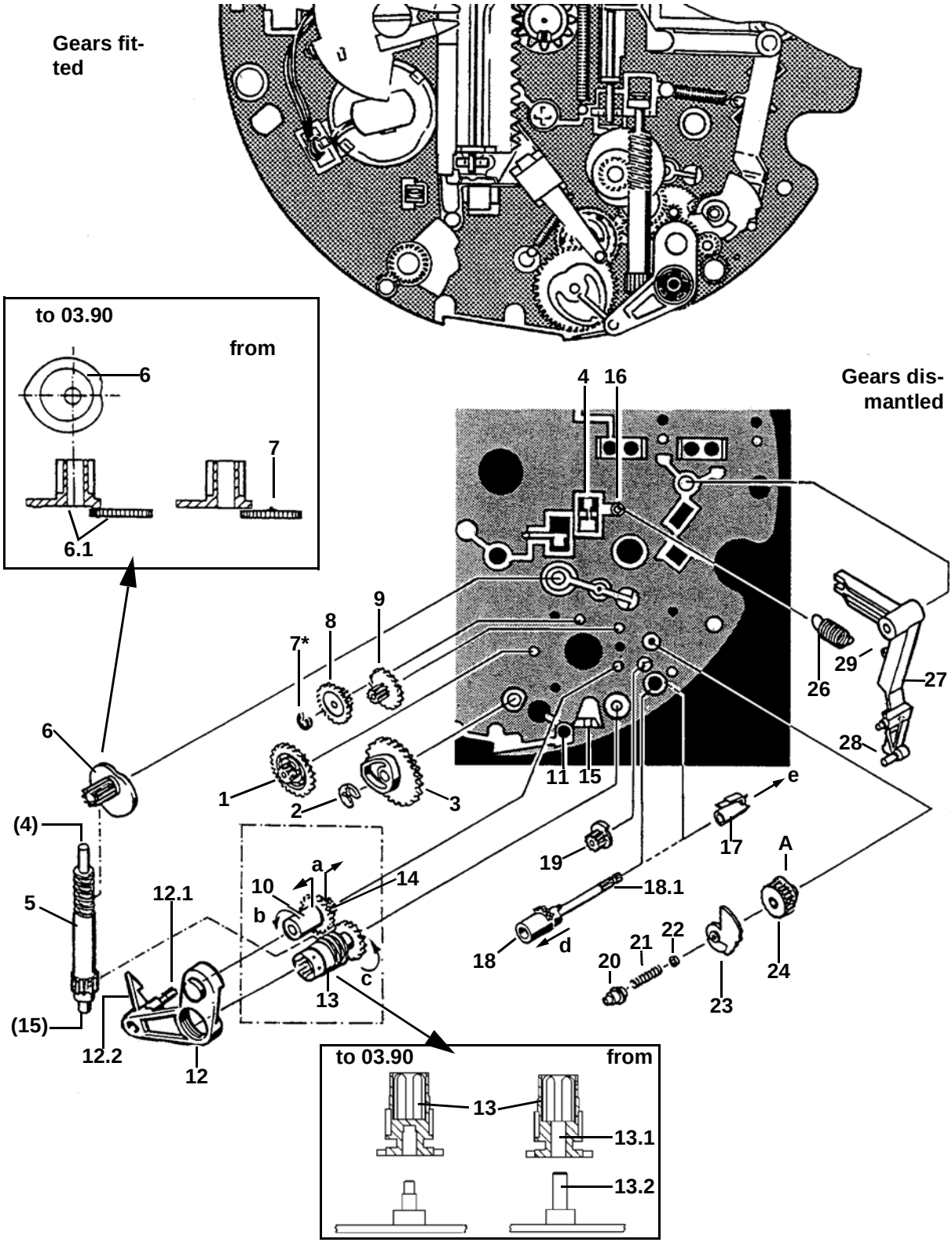

Fig. 3-24 Removing and installing gears (unit type 1318 – 26,–27)

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Key to Abb. 2-24

1	Gear	**12.1**	Front	**21**	Spring
2	Retaining washer*	**12.2**	Hold-down device	**22**	Washer
3	Eccentric	**13**	Coupling sleeve	**23**	Connecting link
4	Frame bearing bracket	**13.1**	Drilled hole	**24**	Eccentric wheel
5	Worm	**13.2**	Stud	**25**	Complete parts
6	Distance cam	**14**	Gear	**26**	Tension spring
6.1	Distance cam with collar	**15**	Frame lock	**27**	Lever
7	Retaining washer*	**16**	Frame stud	**28**	Lever position
8	Gear	**17**	Stop spring	**29**	Grommet
9	Gear	**18**	Spur gear	**30**	Collar
10	Free wheel	**18.1**	Front	**31**	Bottom of grommet
11	Frame aperture	**19**	Stop	**32**	Top of grommet
12	Bracket	**20**	Locking sleeve		

*discontinued

3.8.5.1 Removing gears

Remark

With some units the spur gear (18) is welded to the front (18.1) with the stop spring (17). If necessary release the stop spring (17) and spur gear (18) from each other
and replace.

Procedure

- ❍ **Remove the bracket (12).**
- ❍ **Remove the worm (5).**
- ❍ **Remove the distance cam (6).**
- ❍ **Remove the spur gear (18) from the frame plate in the direction of arrow (d) and at the same time remove the stop spring (17) in the direction of arrow (e).**
- ❍ **Remove the stop (19).**
- ❍ **Remove the locking sleeve (20).**
- ❍ **Remove parts (21), (22), (23), and (24).**
- ❍ **Remove the coupling sleeve (13) and the free wheel (10) together.**
- ❍ **Remove the retaining washer (2).**
  (Available up to about 04.90)
- ❍ **Remove the eccentric (3).**
- ❍ **Remove the gear wheel (1).**
- ❍ **Remove the retaining washer (7).**
  (Available up to about 04.90)
- ❍ **Remove gear wheels (8) and (9).**
- ❍ **Unhook the tension spring (26) from the stud (16).**
- ❍ **Remove the lever (27).**

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3.8.5.2 Installing gears

Remark

Only check by hand (without tools or aids).

Procedure

Removing and installing gears as shown in Fig. 3-24.

Note

- There is no need for a retaining washer (2) when using the bracket (2) with the hold-down device (12.2).
- There is no need for a retaining washer (7) when using the distance cam (6) with a collar (6.1).

❍ **Put in gears (9), (8) and (1) and eccentric (3).**

❍ **Secure with retaining washer (7) or (2) (optional)**

❍ **Check the free wheel (10):**
Grip the gear (14), pull it in the direction of arrow (a) and at the same time turn it in the direction of arrow (b).

The free wheel (10) must move easily.
If you turn it away from the direction of arrow (b) it will be blocked.

❍ **Put in the coupling sleeve (13) and the free wheel (10) together.**

Mind the drilled hole (13.1) and the extended stud (13.2) shown in Fig. 3-24.

❍ **Insert the correct distance cam (6).**

❍ **Insert the worm (5) into the frame bearing block (4) and press into the frame lock (15).**

❍ **Insert the front (12.1) of the bracket (12) into the frame aperture (11).**

❍ **Turn the coupling wheel (13) in the direction of the arrow (c) and press the bracket (12) down.**

The wrap spring incorporated into the bracket (12) locks if it is turned against the direction of arrow (c).

❍ **Put the lever (27) on.**

❍ **Hook the tension spring (26) onto the grommet.**

❍ **Hook the tension spring (26) on the frame stud (16) into the recess.**

If the tension spring (26) moves upward apply securing paint.

❍ **Put the eccentric wheel (24) on in such a way that the highest position (A) is flush with the lever position (28).**

❍ **Put the connecting link (23) on.**

❍ **Fit the washer (22) and the spring (21) and se cure them with the locking sleeve (20).**

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3.8.6 Fitting stop, spur gear and stop spring for driver 1

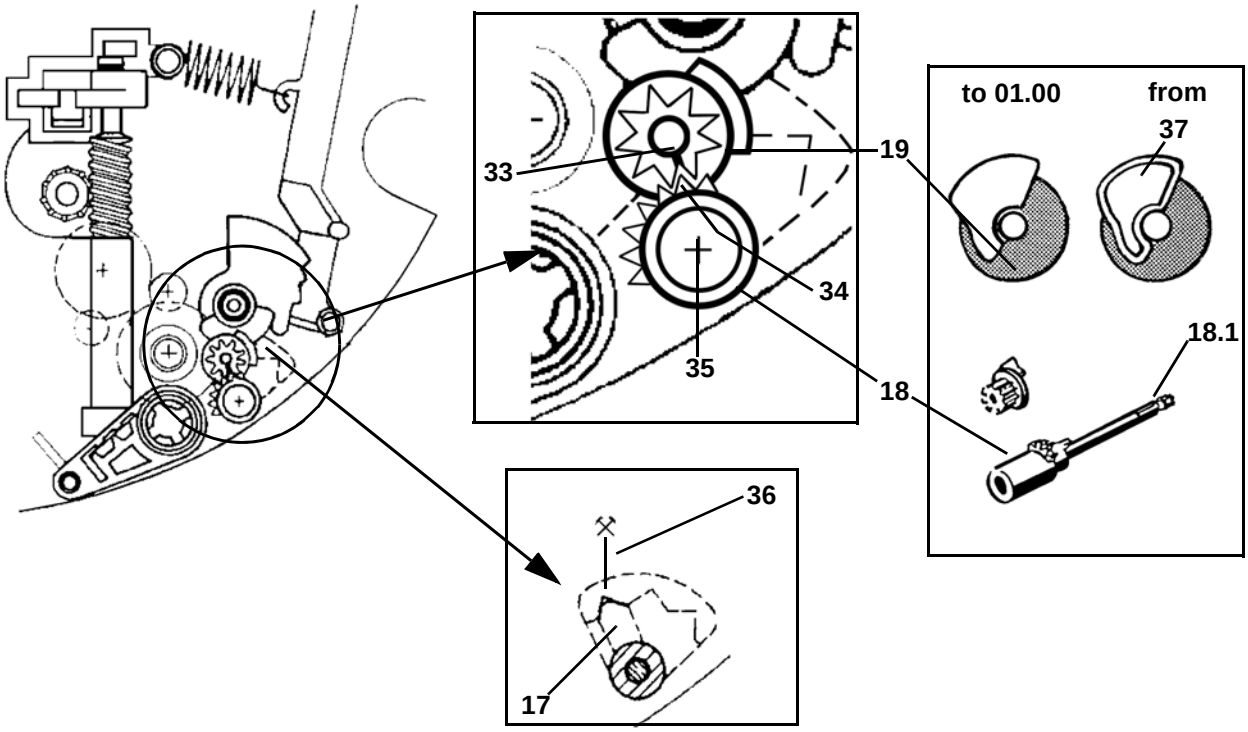

Fig. 3-25 Fitting stop, spur gear and stop spring for driver 1

17 Stop spring
18 Spur gear
19 Stop
33 Marking
34 2nd gear tooth
35 Centre of drilled hole
36 Lock in position
37 Cam segment

! Note

- If the stop spring (17) does **not** snap in when pressed onto the spur gear (18) use a new part.
- Set and check all three locking options.

Modification from 02.00

☞ The cam segment (37) was designed differently at the stop (19).

From 02.00 replacement parts supply was converted to the new stop (19).
For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

Procedure

❍ **Put the stop (19) on in such a way that the marking (33) points to the centre of the drilled hole (35) on the spur gear (18).**
❍ **Insert the spur gear (18) in such a way that the 2nd tooth (34) is opposite the marking (33).**
❍ **In this position press the spur gear (18) downwards.**
❍ **On the bottom of the frame press the stop spring (17) so that it engages into the locking position (36).**

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3.9 Installing/ removing CH time group recording

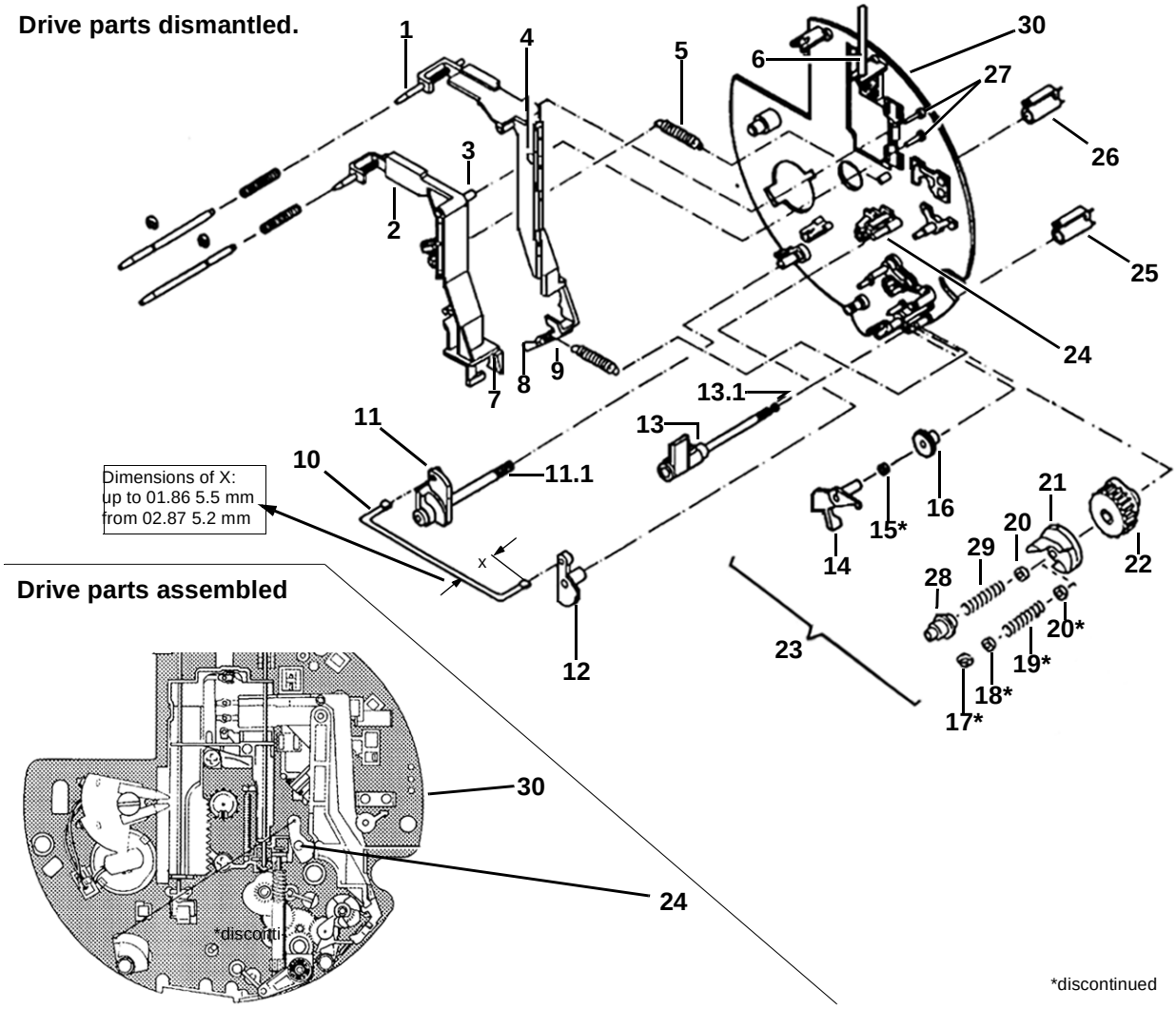

Fig. 3-26 CH drive parts assembled and dismantled

1	Stylus holder	**11.1**	Front	**21**	Connecting link
2	Stylus holder	**12**	Adjustment	**22**	Eccentric wheel
3	Socket	**13**	Spur gear	**23**	Complete parts
4	Stylus holder aperture	**13.1**	Front	**24**	Frame stud
5	Tension spring	**14**	Gear lever	**25**	Stop spring
6	Guide rod	**15**	Close tolerance washer	**26**	Stop spring
7	Fork	**16**	Spur gear	**27**	Stud
8	Lug	**17**	Retaining washer	**28**	Locking sleeve
9	Tension spring	**18**	Close tolerance washer	**29**	Pressure spring
10	Bracket	**19**	Pressure spring	**30**	Frame plate
11	Lever	**20**	Close tolerance washer		

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3.9.1 Removing drive parts

Remark

- With some units the front (11.1) of the lever (11) is welded to the stop spring (25).
- With some units the front (13.1) of the spur gear (13) is welded to the stop spring (26).
- Should they need to be repaired release them and replace both parts.

Procedure

- ❍ **Unhook the guide rod (6) from the frame bracket and pull it out of the stylus carriage guide holes.**
- ❍ **Unhook springs (5) and (9).**
- ❍ **Remove stylus holders (1) and (2).**
- ❍ **Remove the stop spring (25) for driver 1 and the stop spring (26) for driver 2.**
- ❍ **Remove spur gear (13) and parts (23), (28) and (29) from the frame plate (30).**
- ❍ **Remove any material overlapping the sides of the frame stud (24).**
- ❍ **Then remove the adjustment (12), the lever (11) and the bracket (10).**

Using a screwdriver pull the bracket (10) out of the holes.

3.9.2 Fitting stylus holder

Note

- Ensure that the distance carriage is correctly positioned on the distance cam.
- When fitting the stylus holder (2) ensure that the lug (8) is located in the fork (7).

Procedure

- ❍ **Insert the socket (3) of the stylus holder (2) into the aperture (4) of the stylus holder (1).**
- ❍ **Put both stylus holders onto the stud (27) together.**
- ❍ **Fit guide rod (6).**

3.9.3 Fitting switching and drive parts

Remark

- Measure dimension "X" on the bracket and if necessary reduce to 5.2 mm.
- Close tolerance washer (15) when installing the gear lever (20), length 7.3mm not necessary (from 01.87).

Procedure

- ❍ **Hook the bracket (10) into the adjustment holes (12) and (11).**
- ❍ **Use the soldering iron to provide axial protection on the frame stud (24).**
- ❍ **Put the eccentric wheel (22), spur gear (16), close tolerance washer (15), connecting link (21), close tolerance washer (20), pressure spring (19) 0.12 x 1.9 x 13 or (29) 0.15 x 1.8 x 7 and, depending on the version, close tolerance washer (18) onto the relevant frame stud and secure them with the retaining washer (17) or locking sleeve (28).**

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3.9.4 Fitting/ adjusting driver 1 drive parts

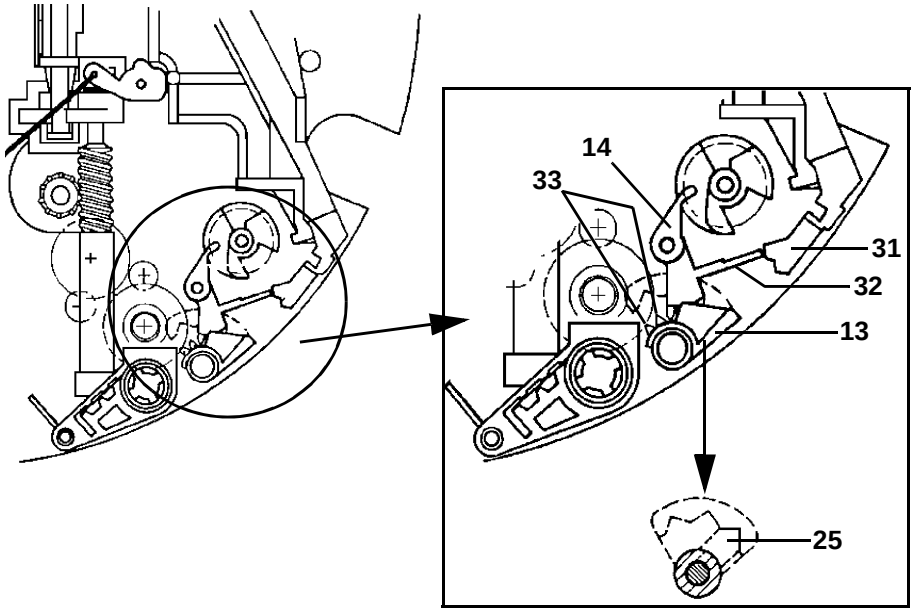

Fig. 3-27 Gear lever/ spur gear (CH)

13 Spur gear
14 Gear lever
25 Stop spring
31 Stylus holder area
32 Gear lever arm
33 Spur gear teeth

Remark

- If the stop spring (25) does **not** snap in when pressed onto the spur gear (13) use a new part.
- Check all three locking options.
- The gear lever arm (32) must be flush with the stylus holder surface (31).

Procedure

- ❍ **Hook the tension springs (5) and (15) on, Fig. 3-29.**
- ❍ **Insert the gear lever (14), the spur gear (13) and the stop spring (25).**
- ❍ **Press the spur gear (13) down without engaging the two spur gear cogs (33).**
- ❍ **Press the stop spring (25) into the position indicated from the bottom of the frame.**

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3.9.5 Fitting on 2 driver unit

3.9.5.1 Fitting driver 2 drive parts

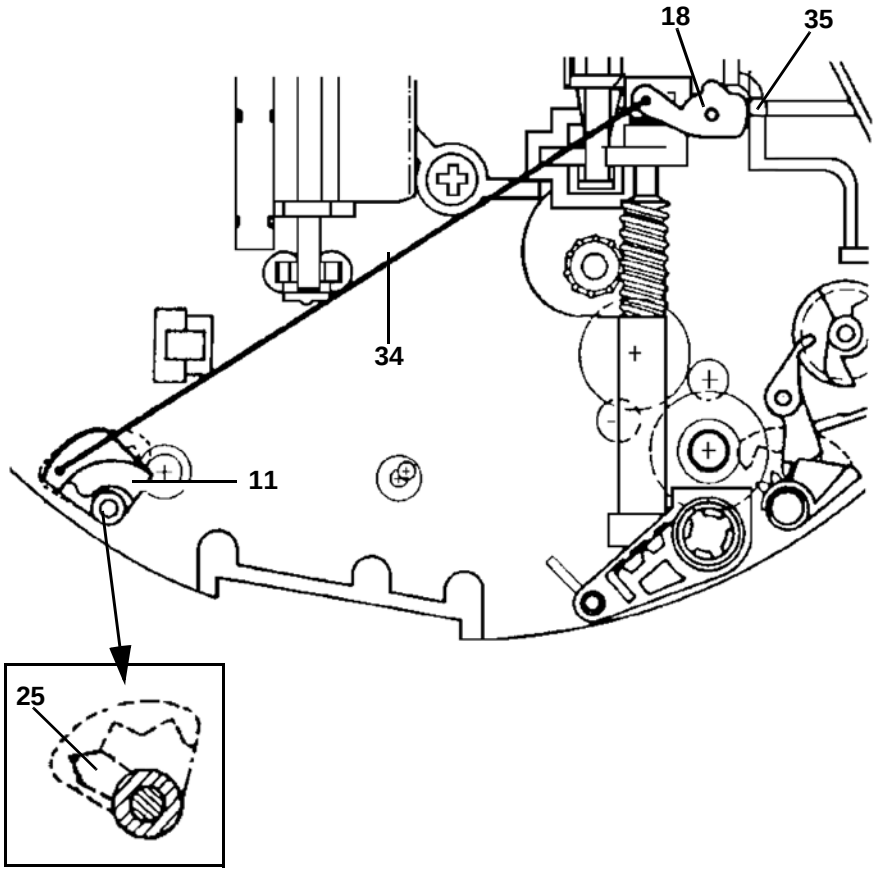

Fig. 3-28 Driver 2 drive parts

11 Lever
18 Adjustment
25 Stop spring
34 Bracket
35 Stop pin

Remark

- If the stop spring (25) does **not** snap in when pressed onto the lever (11) use a new part.
- Set and check all three locking options.

Procedure

- ❍ **Align the bracket (34) with the adjustment (18) so that the stop pin (35) on the stylus holder is in the position shown.**
- ❍ **In this position press the lever (4) downwards.**
- ❍ **Press the stop spring (25) into the position indicated from the bottom of the frame.**

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3.9.5.2 Replacing driver 2 lever

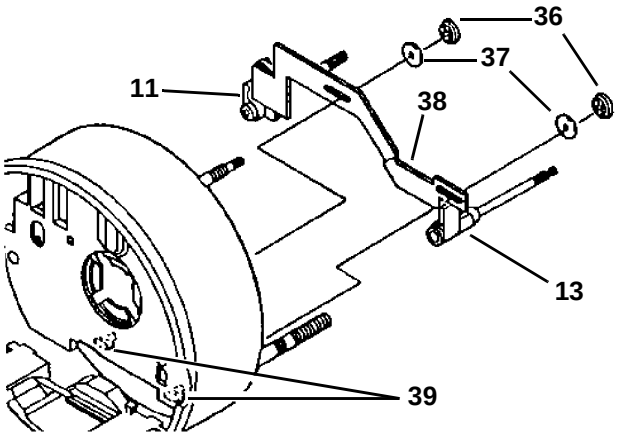

Fig. 3-29 Replacing lever

11 Lever
13 Spur gear
36 Toothed ring
37 Close tolerance washer
38 Connection stud
39 Lever

Procedure

- ❍ **Remove the toothed ring (36).**
- ❍ **Remove the close tolerance washer (37) and the lever (38).**
- ❍ **Insert the lever (38) into the connection lug (39) on the back of the housing.**
- ❍ **Fit the close tolerance washer (37).**
- ❍ **Press the toothed ring (36) down.**
- ❍ **Check for ease of movement.**

Check that the lever works.

- ✓ Using the lever (38) ensure that only one knob can be in position "⊜ ".
- ✓ Lever (38) is between the spur gear (13) and lever (11).
- ✓ Using the lever (38) ensure that the lever (11) and the spur gear (13) can be pushed from the "⊜ " knob position alternately.

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3.10 Speed measuring system

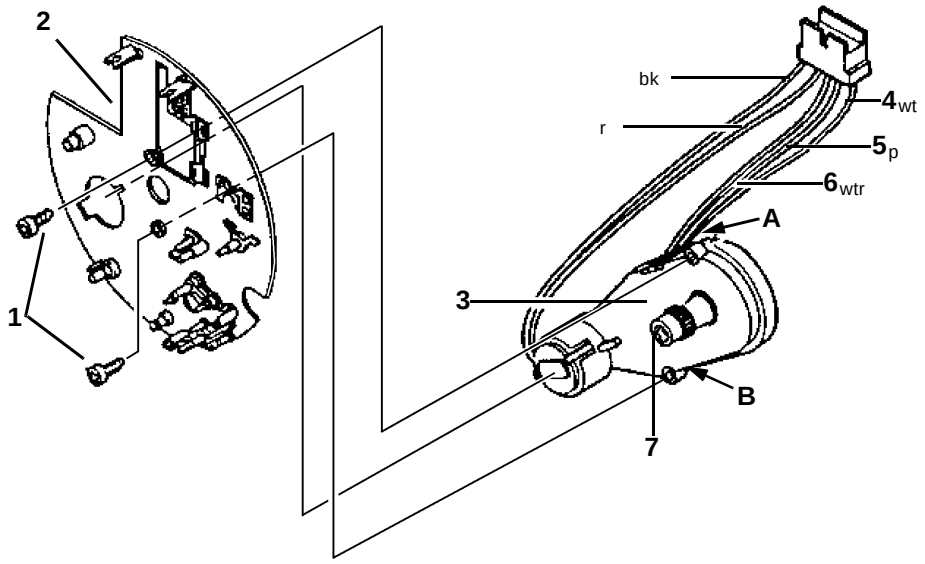

Fig. 3-30 Removing and checking speed measurement system

1 Screw
2 Frame plate
3 Speed measuring system
4 Wire (white)
5 Wire (pink)
6 Wire (white – red)
7 Coupling

! Note

- It is no longer possible to open and repair the speed measuring system (3).
- Should it need to be repaired replace the whole speed measuring system (3).

3.10.1 Removing speed measuring system

Procedure

❍ **Remove the screws (1).**
❍ **Remove the speed measuring system (3) from the frame plate (2).**

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3.10.2 Checking and replacing speed measurement system

3.10.2.1 Checking speed measuring system

Procedure

- ❍ **Connect a measuring device between wires (4) and (5) and determine the resistance value.**

  Permissible value: R = 5 KΩ ± 10%

- ❍ **Connect the resistance measuring device to wires (4) and (6).**
- ❍ **Turn the coupling (7) slowly and evenly.**
- ❍ **As you turn the coupling (7) read off the resistance value.**

  Permissible resistance value:
  Depending on the direction of rotation in a range from about 200 Ω to 4 KΩ.
  The resistance value may only rise or fall evenly.

3.10.2.2 Replacing the speed measurement system when faulty

Remark

Repair:
For an abrupt, uneven change in the resistance value between cables (4) and (6).

Procedure

- ❍ **Replacing the speed measurement system (3) completely**

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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3.10.3 Checking and replacing motor

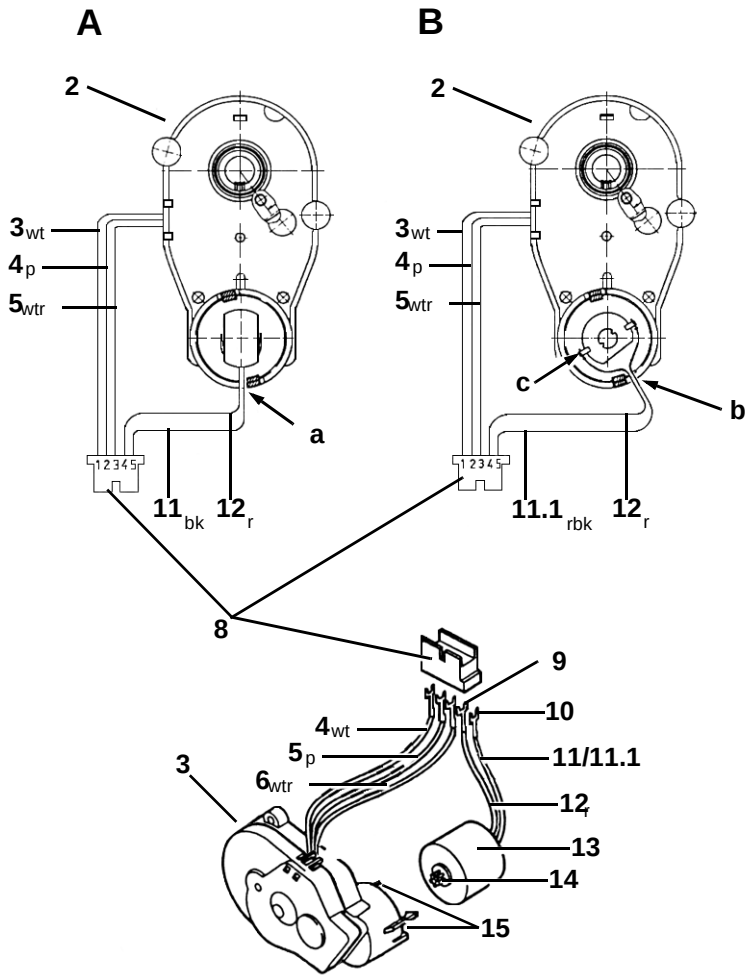

Fig. 3-31 Checking and replacing motor

3 Speed measuring system
4 Wire (white)
5 Wire (pink)
6 Wire (white – red)
8 Socket housing
9 Contact
10 Contact
11 Wire (black with Model "A")
11.1 Wire (red/black with Model "B")
12 Wire (red)
13 Motor
14 Pinion
15 Catch lugs

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Note

- Model A can be identified by the black wire (11).
- Model B can be identified by the red-black wire (11.1).
- If this is disregarded (operate model B with approx. 120 km/h warning value setting):
  - Short circuit at ©.
  - V board destroyed.

3.10.3.1 Checking motor

Procedure

- ❍ **Carry out visual check.**
- ❍ **Check that the pinion (14) is running freely by turning it slowly and evenly.**
- ❍ **Check the resistance value of the motor coil between wires (12) and (11) or (11.1) with a measuring device.**

Permissible value: R = 50 KΩ ± 10%

3.10.3.2 Replacing motor when faulty

Remark

Repair:
For an abrupt, uneven change in the measured value on the motor coil between cables (11) or (11.1) and (12).

Note

- Use the special tool to fit and remove contacts (9) and (10) on the socket housing (8). (See Chapter *3.10.4)*
- Connection leads (11) or (11.1) and (12) are positioned depending on the model.
  - With model A at (a)
  - With model B at (b)

Procedure

- ❍ **Push the catch lugs (15) away slightly and push the motor out of the speed measuring system frame (3).**
- ❍ **Remove contacts (9) and (10) from the socket housing (8).**
- ❍ **Lock the new motor (13) into the frame on the speed measuring system (3).**
- ❍ **Fit contacts (9) and (10) into the socket housing (8).**

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3.10.4 Removing and fitting socket housing contacts

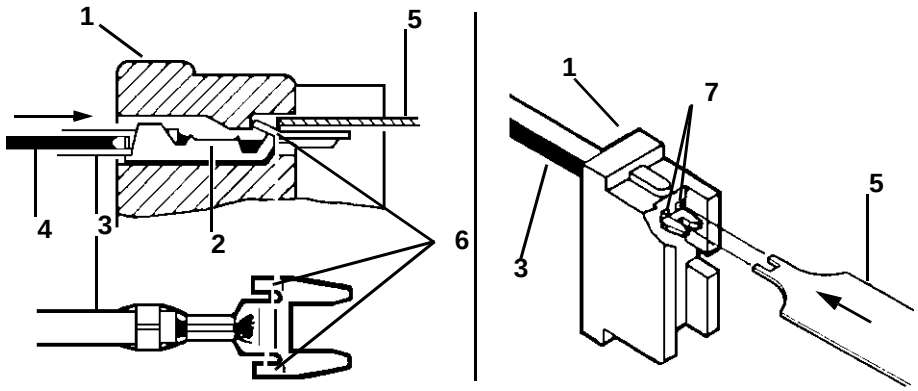

Fig. 3-32 Removing and fitting socket housing contact

1	Socket housing	**5**	Special tool
2	Contact	**6**	Catch lugs
3	Wire	**7**	Apertures
4	Screwdriver		

3.10.4.1 Pull contacts

Remark

- Do not pull on the contacts with too much force!
- If the catch lugs (6) do not unlock at the first attempt repeat the procedure.

Procedure

- ❍ **Grip the socket housing (1).**
- ❍ **Unhook the catch lugs (6) by pressing the contact (2) against the socket housing with a screwdriver.**
- ❍ **In this position push the special tool (5) into both openings (7) and unlock the catch lugs (6).**
- ❍ **Remove the screwdriver (4).**
- ❍ **Pull the wire (3) and the contact (2) out of the socket housing (1).**

3.10.4.2 Fitting contacts

Remark

With the contact (2) out use a screwdriver to put the two catch lugs (6) back into the original position.

Procedure

- ❍ **Push the contact (2) into the corresponding socket housing chamber (1) until the catch lugs (6) engage.**
- ❍ **By pulling gently on the wire (3) check that the catch lugs (6) have engaged.**

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3.10.5 Speed measuring system

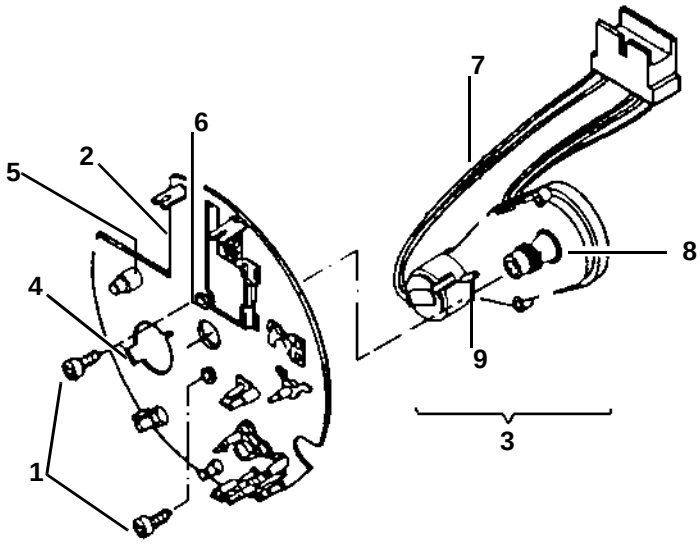

Fig. 3-33 Installing speed measuring system

1	Screws	**6**	Drilled hole
2	Frame plate	**7**	Motor wires
3	Speed measuring system	**8**	Collar
4	Recess (cable)	**9**	Lug
5	Recess		

Procedure

- ❍ **Insert the 11mm ø collar 11 mm (for 180 km/h 14mm ø and larger gearing) into the drilled hole (6).**
- ❍ **Insert the lug (9) into the recess (5).**
- ❍ **Insert the motor wires (7) into the recess (4).**
- ❍ **Insert the speed measuring system (3) into the centre of the frame plate (2).**
- ❍ **Fix the speed measuring system (3) to the frame plate (2) with the screws (1).**

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3.11 Distance/ WT motor

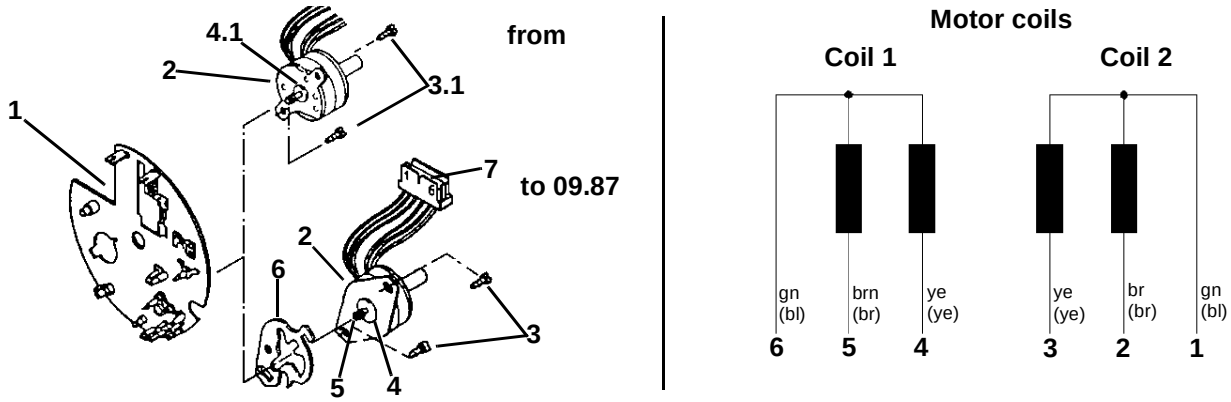

Fig. 3-34 Removing, installing and checking distance and WT motor

1	Frame plate	**4.1**	Collar
2	Distance/ WT motor	**5**	Motor pinion
3	Screws	**6**	Flange
3.1	Screws	**7**	Socket housing
4	Collar		

Remark

- From 10.87 the flange (6) on the distance and WT motor (2) was discontinued and the frame plate (1) was modified.
- Please note the description in Chapter 3.11.4 when installing a distance or WT motor (2) without a flange (6) in a frame plate (1) which has **not** been modified.

3.11.1 Removing distance or WT motor

Procedure

❍ **Undo screws (3) or (3.1).**

❍ **Remove the distance or WT motor (2) and the optional flange (6) from the frame plate (1).**

3.11.2 Checking the distance/ WT motor

Check

✓ Carry out a visual check.

✓ Check that the motor pinion (5) is running freely by turning it.

✓ Connect the measuring unit to coil 1 pin 6 of the socket housing (6) and measure the resistance value at pins 5 and 4.
(Colour code in brackets, see Abb. 2-34 right hand picture).

✓ Repeat measurement on coil 2, pin 1 to pin 2 and pin 1 to 3.

– Permissible measurement with 24 V units: R = 700 Ω ± 10%

– Permissible measurement with 12 V units:
R = 180 Ω ± 10% or R = 150 Ω ± 10%

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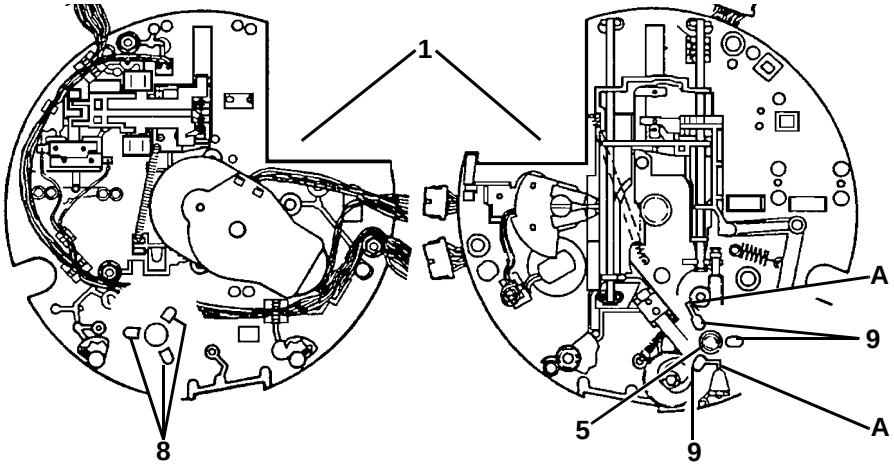
3.11.3 Replacing and installing distance or WT motor when faulty

Remark

Repair:
Measurements on coil 2 or coil 2 are outside the specified tolerance.

- ❍ **Insert the new distance/ WT motor (2) into the frame plate (1).**
  When doing this insert the motor pinion (5) and collar (4) ø 11 mm (or collar (4.1) ø 8 mm)
  correctly into the frame plate (1).
- ❍ **Fix the distance/ WT motor (2) onto the frame plate (1) with the screws (3) 2.5 x 6 (or (3.1) 2.5 x 5).**

3.11.4 Preparing frame plate (version till 09.87) for installing distance/ WT motor (version from 10.87)



Back until 09.87 Front until 09.87

Fig. 3-35 Frame with three flange centring bars

1	Frame plate up to 09.87	**8**	Centring bars
5	Motor pinion	**9**	Plastic parts

Remark

- When installing the distance/WT motor (from 10.87), without flange, modify the frame plate (up to 9.87) with three centring bars (8).
- There is no need to centre the flange (6) and adjust the tooth play to the pinion (5).

Procedure

- ❍ **Shear off the three centring bars (8) with flat nosed pliers by rotating them.**
- ❍ **On the front of the frame plate (1) remove parts from the motor pinion (5) until the plastic parts (3) are accessible.**
- ❍ **Cut through the lugs at position (A) with a knife.**
- ❍ **Remove plastic parts (9).**
- ❍ **Complete the frame plate (1) again at the motor pinion (5).**

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3.12 Replacing contact set for warning device (up to 04.90)

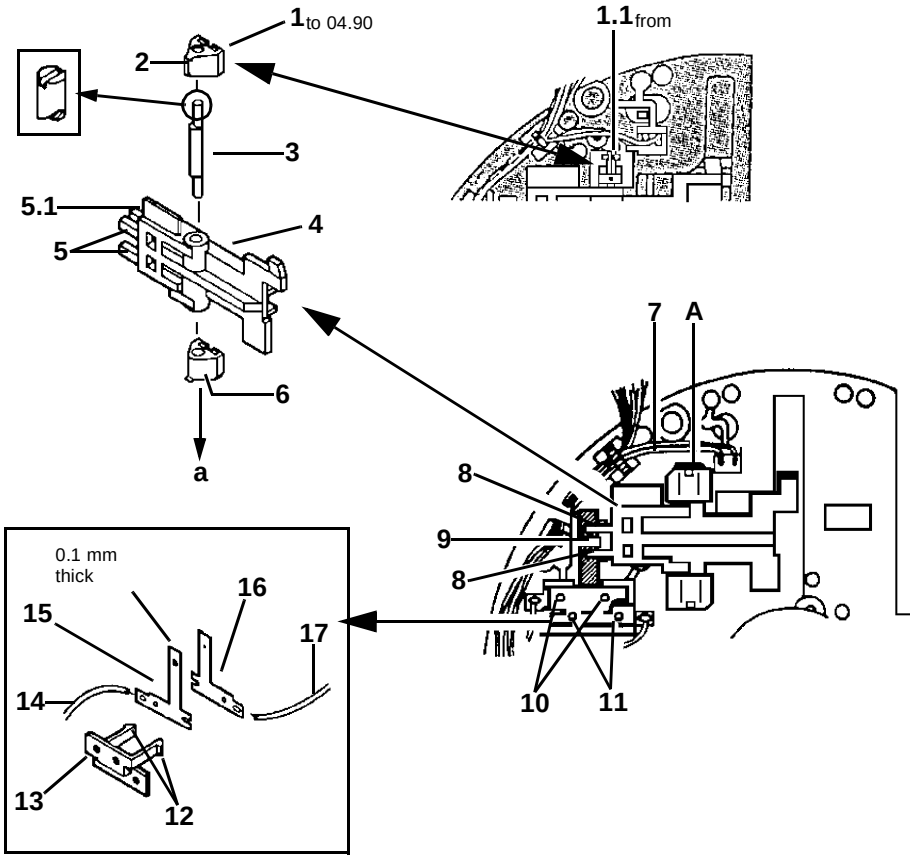

Fig. 3-36 Replacing contact set for warning device (up to 04.90)

1	Bearing bracket	**9**	Frame lug
1.1	Bearing bracket moulded (from 05.90)	**10**	Frame stud
2	Lug on bearing bracket	**11**	Frame stud
3	Eccentric shaft	**12**	Lugs for bracket
4	Rocker	**13**	Bracket
5	Lug for rocker	**14**	Wire
5.1	Lug for rocker	**15**	Contact spring
6	Bearing bracket	**16**	Contact spring
7	Cables	**17**	Wire
8	Lugs		

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Modified since 05.90

☞ The bearing bracket (1) is moulded to the frame plate (1.1).

Procedure when removing

- ❍ **Lift up the wires (7).**
- ❍ **Remove the securing paint in area (A).**
- ❍ **Loosen the eccentric shaft (3) by rotating it.**
- ❍ **Pull the bearing bracket (6) out in the direction of the arrow.**
- ❍ **Lift the rocker (4) and push the bearing bracket (1) out of the guide.**
- ❍ **Disengage the lugs (12) from the bracket (13).**
- ❍ **Remove contact springs (15) and (16).**

If contact springs (15) and (16) are faulty, unsolder wires (14) and (17) and replace.

Procedure for installing

- ❍ **Put contact springs (15) and (16) onto the frame studs (10) and (11).**
- ❍ **Secure the contact springs by putting the bracket (13) on.**
- ❍ **Push the bearing bracket (1) on the frame plate into the frame guide.**

Lug (2) points to the outer edge of the frame.

- ❍ **Push the rocker (4) and the eccentric shaft (3) together and insert them into the bearing bracket (1) together.**

Contact springs (13) and (14) must be located between rocker lugs (5) and (5.1).

- ❍ **Push the bearing bracket (6) onto the frame plate.**

The lug must point in the direction of the arrow (a) towards the middle of the frame.

- ❍ **Move bearing brackets (1) and (6) until there is no play between the bearing brackets and the rocker (4).**

The frame lug (9) must be between the lugs (8).

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3.12.1 Modified contact set for warning device (up to 10.91)

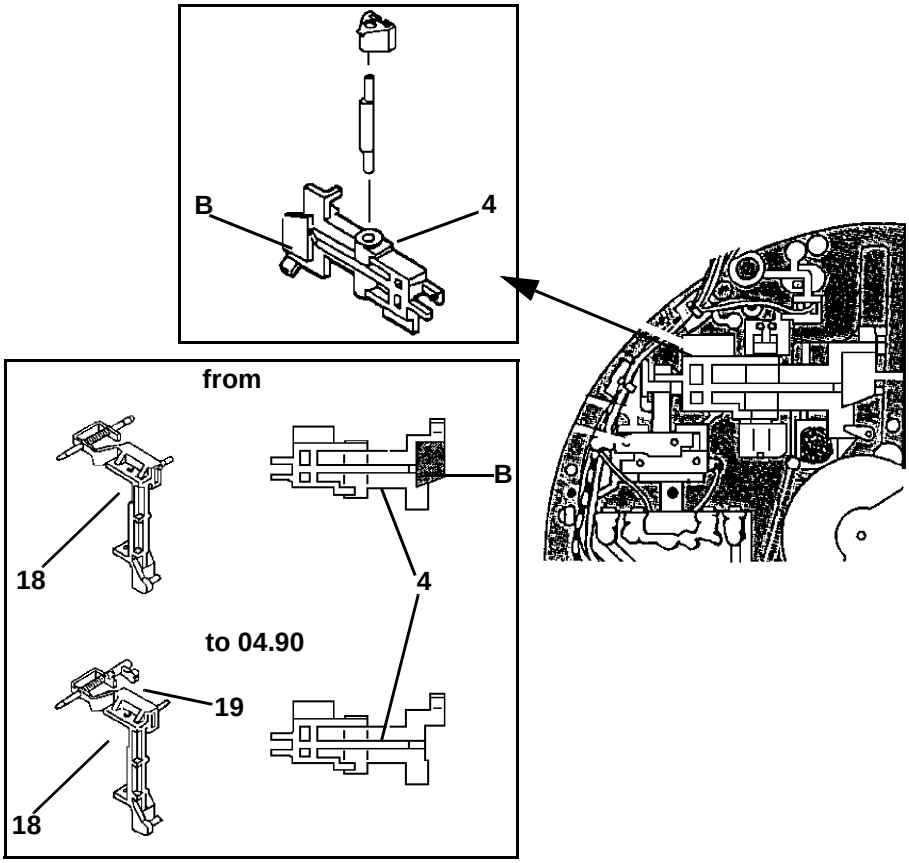

Fig. 3-37 Replacing contact set (up to 10.91)

4 Rocker
18 Complete working time carriage
19 Bracket

Remark

In the event of a repair:

- Adjustment remains unchanged.
- From 05.90 insert rocker (4) and working time carriage (18) together.

— **or** —

- Up to 05.90 insert rocker (4) and working time carriage (18) with bracket (19).

Modified since 05.90

☞ External shape of rocker (4) in area (B).

☞ Bracket (19) on working time carriage (18) discontinued.

Working time carriages (18) can be supplied as replacement parts without brackets (19).
For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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3.12.2 Modified contact set for warning device (up to 07.93)

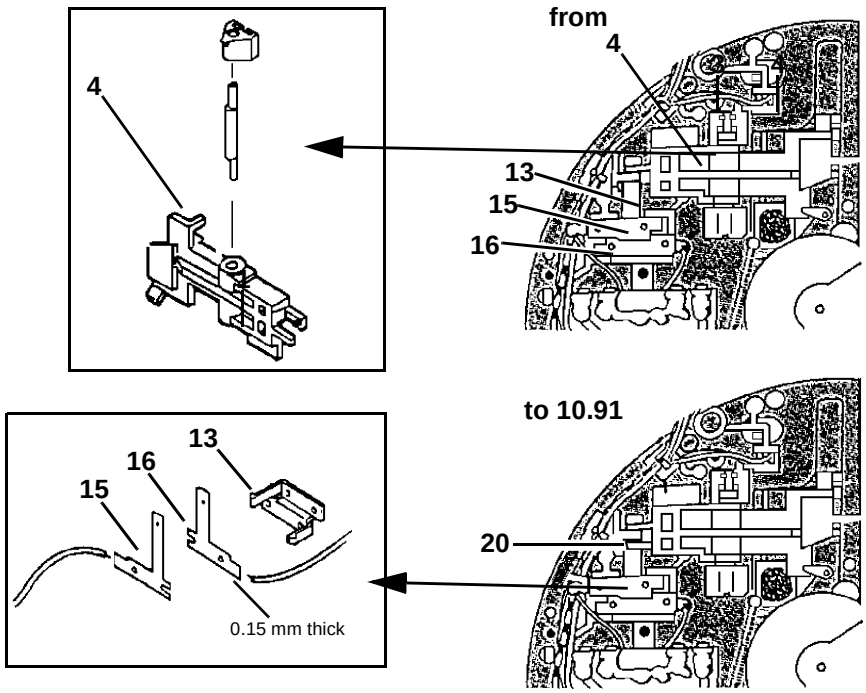

Fig. 3-38 Modified contact set for warning device (up to 07.93)

4 Rocker
13 Bracket
15 Contact spring
16 Contact spring
20 Guide lug

Remark

In the event of a repair:

- Replace rocker (4), contact springs (15), (16) and bracket (13) together.
- Adjustment remains unchanged.

Modified since 11.91

- ☞ The guide lug (20) is discontinued on the rocker (4).
- ☞ The contact spring (15) was increased from 0.1 mm to 0.15 mm.
- ☞ The size of the bracket (13) was changed.

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3.12.3 Modified contact set for warning device (up to 04.94)

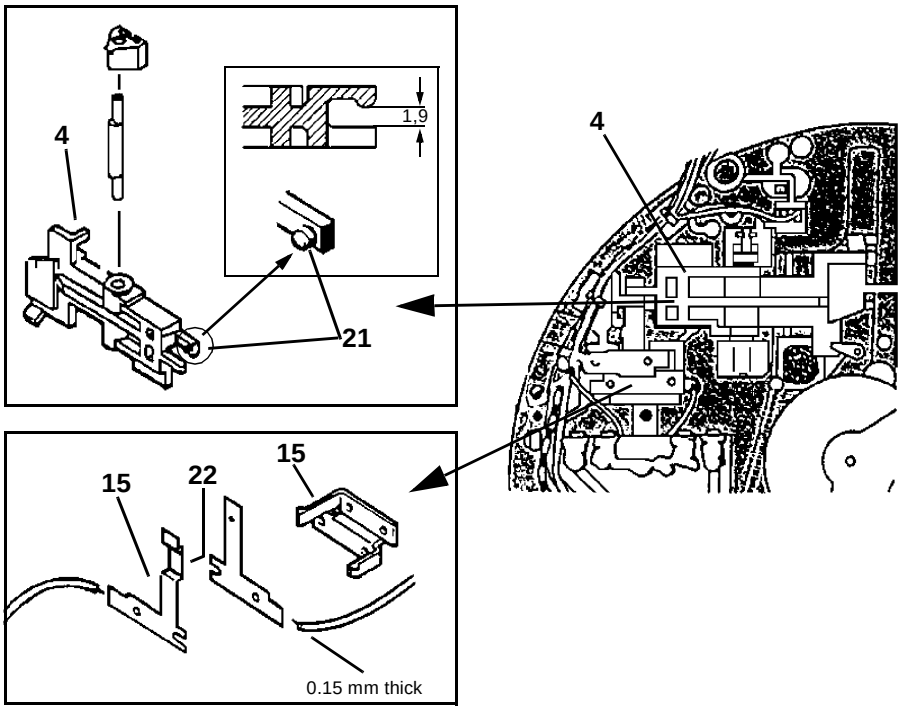

Fig. 3-39 Modified contact set for warning device (up to 04.94)

4	Rocker	**21**	Ridge
13	Bracket	**22**	Contact area
15	Contact spring	**23**	

Remark

In the event of a repair:

- Replace rocker (4), contact spring (15) and bracket (13) together.
- Adjustment remains unchanged.

Modified since 08.93

☞ The rocker (4) has a ridge (21).

☞ Contact spring (3) suitable for rocker (4) with silver–plated contact area (22) and no contact rivet.

From 08.93 install rocker (4) with ridge (21) and suitable contact spring (15) in all 1318 units.

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3.12.4 Modified contact set for warning device (from 05.94)

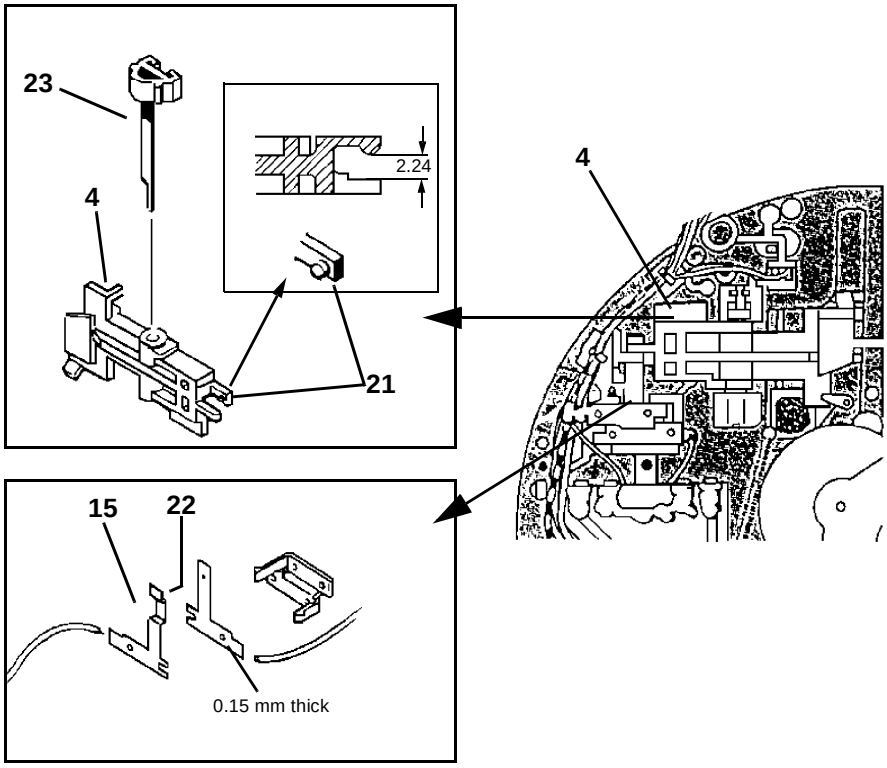

Fig. 3-40 Modified contact set for warning device (from 05.94)

4 Rocker
15 Contact spring
21 Ridge
22 Contact area
23 Bearing bracket with axle

Remark

- For problems with the warning LED please refer to Chapter 2.17.4.
- The complete unit is also compatible with earlier 1318 units.
- Adjustment no longer necessary.

Modified since 05.94

☞ Size of the ridge (21) on the rocker (4) increased by 2.24 mm.

☞ Bearing bracket and eccentric shaft manufactured as one part and renamed as bearing block with axle (23).

Contact spring (15) and contact area (22) and the other parts remain unchanged. Since 05.94 the current rocker (4) has been installed in all 1318 units.

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3.13 Replacing carriage contact

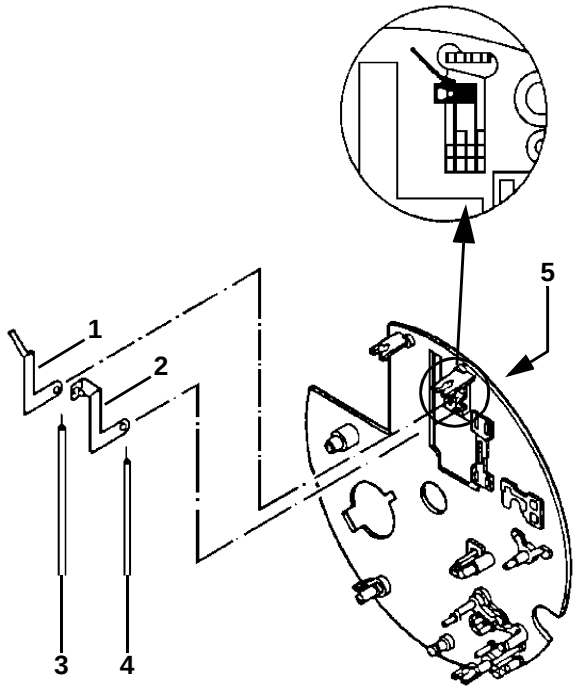

Fig. 3-41 Replacing carriage contact

1	Contact spring	**4**	Connection cable
2	Contact spring	**5**	Back of frame plate
3	Connection cable		

Procedure when removing

- ❍ **Unsolder connection cables (3) and (4) on the back of the frame (5) and suck any solder out with a vacuum pump.**
- ❍ **Disengage contact springs (1) and (2) and remove them.**

! Note

When inserting contact springs (1) and (2) ensure that they engage securely.

Procedure for installing

- ❍ **Insert contact spring (2).**
- ❍ **Insert contact spring (1).**
- ❍ **Solder connection cables (3) and (4).**

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3.14 Fitting frame plate

3.14.1 Installing stylus unit and making sure it engages

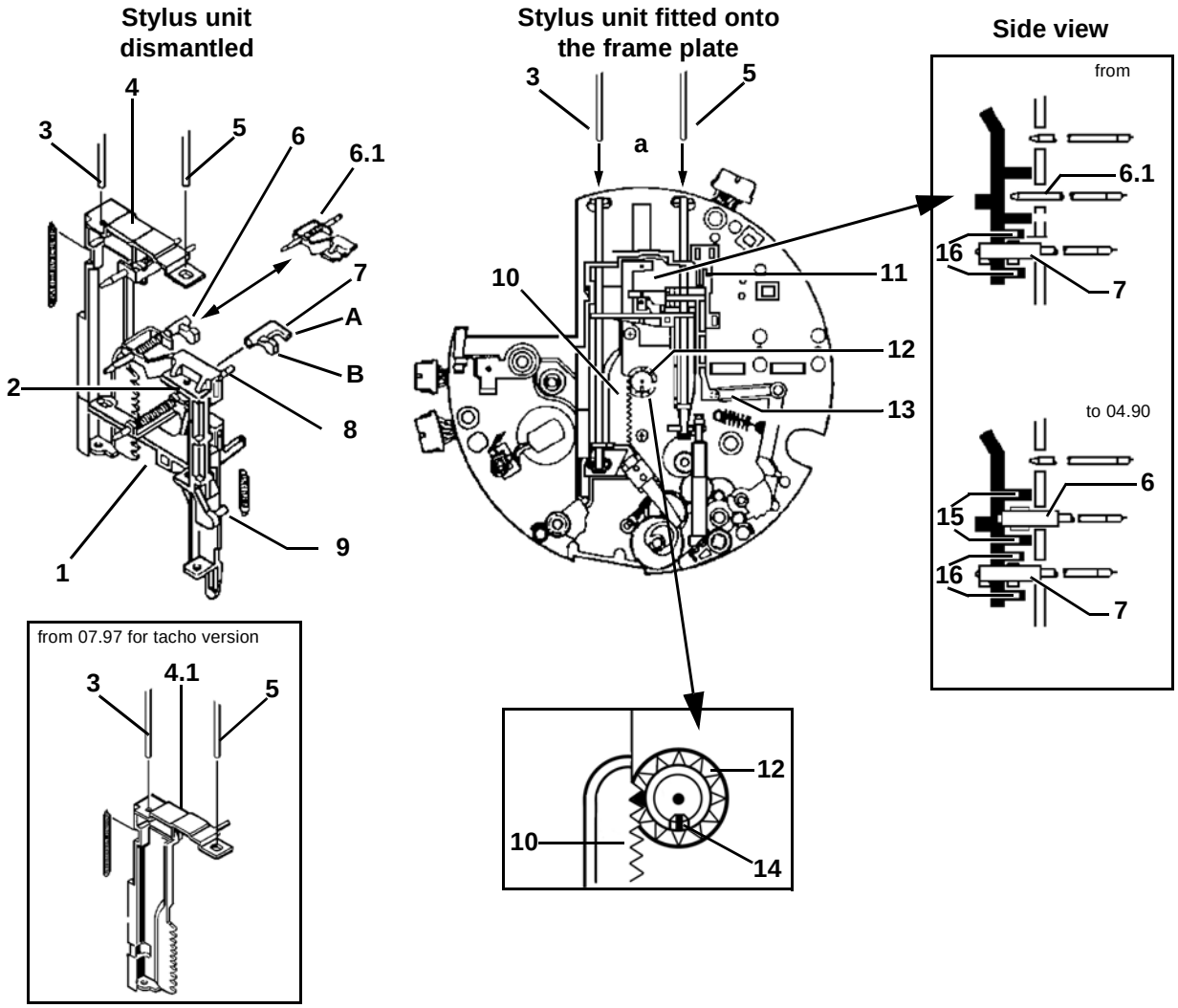

Fig. 3-42 Fitting stylus unit

1	Distance carriage	**8**	Pin
2	Working time carriage	**9**	Pin
3	Guide rod, long	**10**	v carriage gear rack
4	Speed carriage	**11**	Guide for WT carriage
4.1	Speed carriage (tacho)	**12**	Coupling
5	Guide rod, short	**13**	Lever
6	anti-twist device up to 04.90	**14**	Slot
6.1	Anti-twist device from 05.90	**15**	Guide lugs
7	Anti-twist device	**16**	Guide lugs

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Modification

☞ From 05.90 anti-twist device (6) discontinued.

☞ From 07.97 the speed carriage (4.1)
of the tacho version does not have a contact path and stylus.

Procedure

❍ **Place the speed carriage (4), working time carriage (2) and distance carriage (1) together.**

❍ **Slide in the 96.5 mm guide rod (3) and the 85 mm guide rod (5).**

❍ **The speed measuring system coupling (12) takes up the illustrated position (mind the slot (14)).**

❍ **Fit the complete stylus unit to the frame plate.**

Ensure that the following applies:

✓ The coupling (12) must engage in the speed carriage (4) between the 1st and 2nd tooth of the gear rack (10).

✓ The working time carriage pin (8) must be in the frame guide (11).

✓ The working time carriage pin (9) must engage in the lever (13).

✓ Available up to 04.90:
Anti-twist device (6) must be between the two rocker guide lugs (15).

✓ The anti-twist device (7) must be in position (A) between the two guide lugs (16) and at position (B) under the rocker.

❍ **Press the guide rods (3) and (5) into the 4 frame brackets and move in the direction of the arrow (a) until they reach the stop.**

❍ **Check that they have engaged once more.**

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3.14.2 Fitting the tension spring/ v contact carrier/ wires

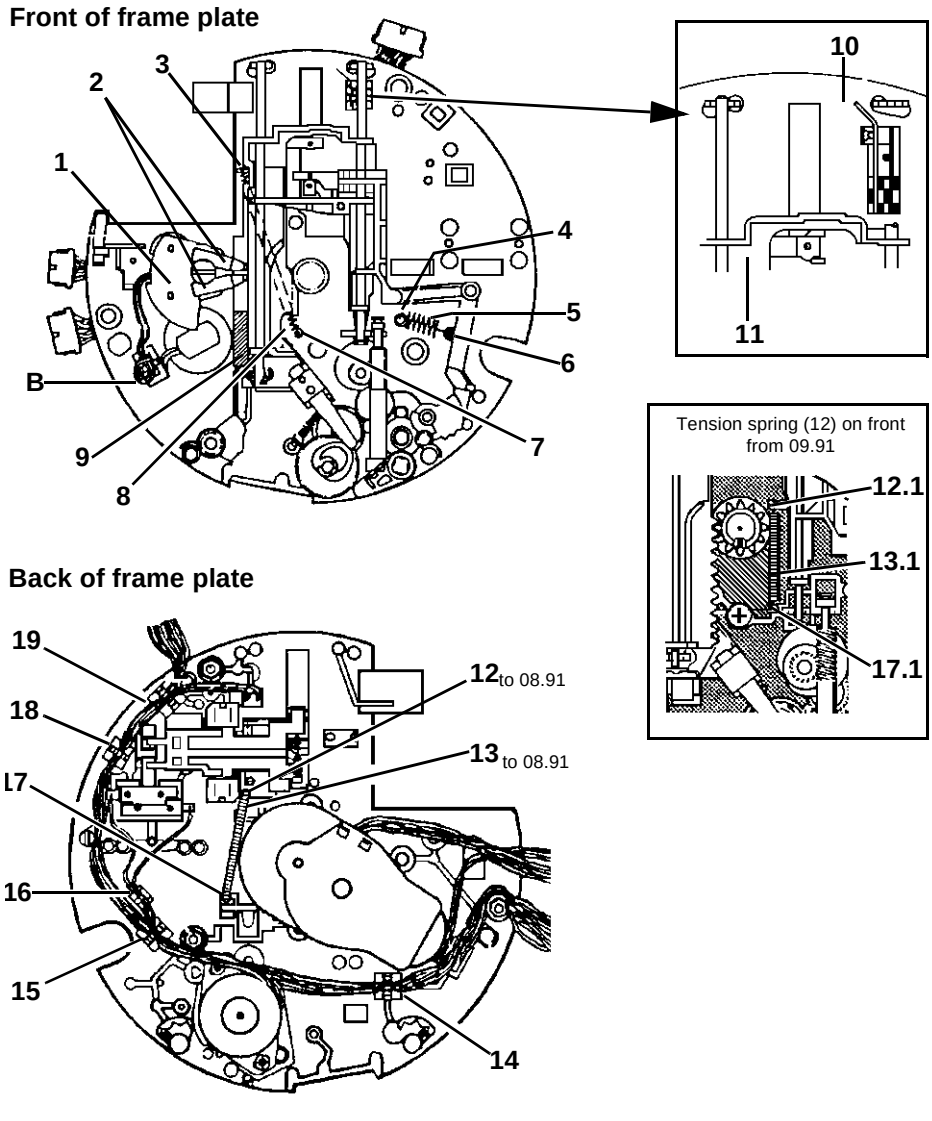

Fig. 3-43 Complete front and back of frame plate

1	Contact carrier	**12**	Grommet
2	Contact spring	**12.1**	Grommet
3	Lug for tension spring	**13**	Tension spring
4	Frame stud	**13.1**	Tension spring
5	Tension spring	**14**	Cable clip
6	Lever lug	**15**	Cable clip
7	Frame stud	**16**	Cable clip
8	Tension spring	**17**	Frame stud
9	v carriage contact area	**17.1**	Frame stud
10	Carriage contact	**18**	Cable clip
11	v carriage	**19**	Cable clip

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3.14.2.1 Hook on tension springs

Modified since 09.91

☞ The tension spring (13) (0.25 x 3 x 17) was routed on the front (see item (13.1)).

☞ Distance carriage has two grommets (12) and (12.1).

Procedure

❍ **Hook the tension spring (8) onto the frame stud (7) and onto the speed carriage lug (3).**

❍ **Up to 08.91 hook the tension spring (13) on the back of the frame onto the frame stud (17) and onto the distance carriage grommet (12).**

—— **or** ——

❍ **From 09.91 hook the tension spring (13.1) (0.25 x 3 x 15.3) on the front onto the frame stud (17.1) and onto the distance carriage grommet (12.1).**

Check

✓ The tension spring (5) for the working time carriage is hooked onto the frame stud (4) and onto the lever lug (6).

✓ Secure all tension springs on both sides with paint.

✓ Check that the gears and carriages are running smoothly.

3.14.2.2 Checking the carriage contact

Check

✓ Contact spring (10) is closed in the rest position.

✓ When moving the v carriage (11) up to the stop (end of range) the contact spring (10) opens.

If necessary readjust the v carriage (11) and contact spring (10).

3.14.2.3 Fitting v contact carrier onto the frame plate

! Note

Ensure that the connection leads are not overstretched at position (B) .

Procedure

❍ **Before they are installed check that the contact springs (2) when they are pre-tensioned are flush with the contact carrier and are at the same level.**

❍ **Press the contact carrier (1) up to the stop on the frame plate.**

❍ **Check whether the contact springs now move away from the contact carrier and whether, when they are pre-tensioned, they are flush with the v carriage contact area (9).**

3.14.2.4 Running the cables on the frame plate

Procedure

❍ **Lay the cables as shown in Fig. 3-46.**

❍ **Use the existing clips (14), (15), (16), (18) and (19)**

❍ **If necessary apply some adhesive to clip (18).**

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3.15 Replacing grip head, jack socket and test socket on housing

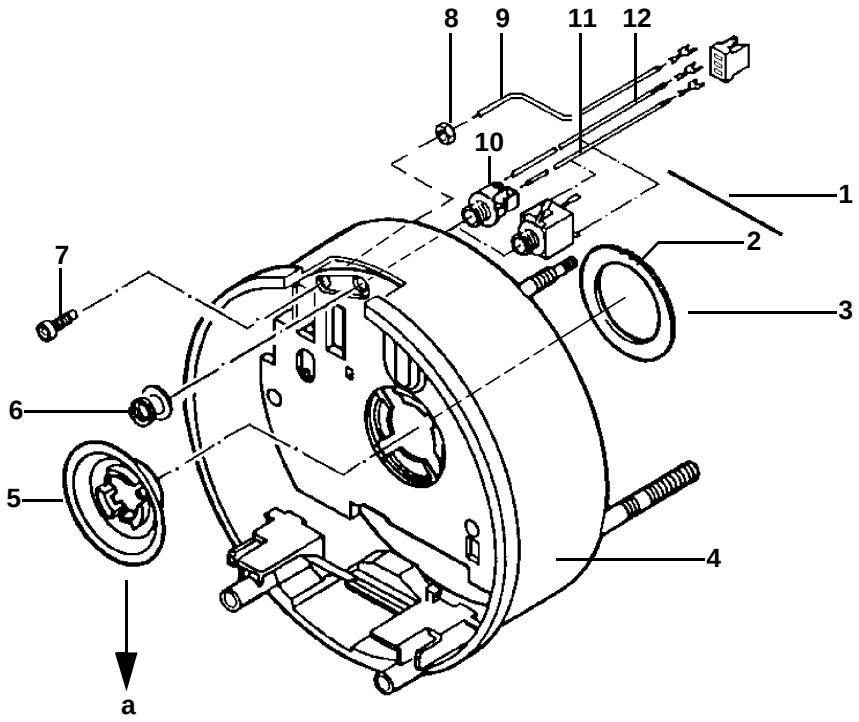

Fig. 3-44 Replacing grip head, jack socket and test socket

1	Spring	**7**	Test sockets
2	Grommet	**8**	Nut
3	Washer	**9**	Wire
4	Housing	**10**	Jack socket
5	Grip head	**11**	Wire
6	Nut	**12**	Wire

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3.15.1 Replacing grip head

Procedure when removing

- ❍ **Carefully disengage the 3 grip head lugs (5) from the washer (3).**
- ❍ **Remove both parts of the housing (4).**
- ❍ **Replace the defective washer (3) or defective grip head (5).**

Procedure for installing

- ❍ **Put the grip head (5) on the housing (4).**
- ❍ **Put the washer (5) on the housing (4) and engage it into the grip head catch lugs (5)**
  .
- ❍ **Hook the spring (1) into the housing pockets on the left and right.**
- ❍ **Hook the middle of the spring (1) into the washer (3) grommet (2).**
- ❍ **Close the grommet (2).**
- ❍ **To check that it is working:**
  Push the grip head (5) in the direction of the arrow (a).
  The grip head must spring back into the original position.

3.15.2 Replacing jack socket for speed.

Procedure when removing

- ❍ **Unsolder wires (11) and (12) on the 2 pole jack socket (10).**
- ❍ **Undo and remove the nut (6) from the jack socket (10).**
- ❍ **Remove the jack socket (10).**
- ❍ **If it is defective replace it.**

Procedure for installing

- ❍ **Put the jack socket (10) into the housing (4).**
- ❍ **Fix the jack socket (10) with the nut (6).**
- ❍ **Solder wires (11) and (12).**

3.15.3 Replacing rpm test socket

Procedure when removing

- ❍ **Solder test socket (7) wire (9).**
- ❍ **Undo and remove the nut (8) from the test socket (7).**
- ❍ **If it is defective replace it.**

Procedure for installing

- ❍ **Put the test socket (7) into the housing (4).**
- ❍ **Fix the test socket (7) with the nut (8).**
- ❍ **Solder the wire (9).**

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3.16 Completing back of housing

3.16.1 Fitting the frame

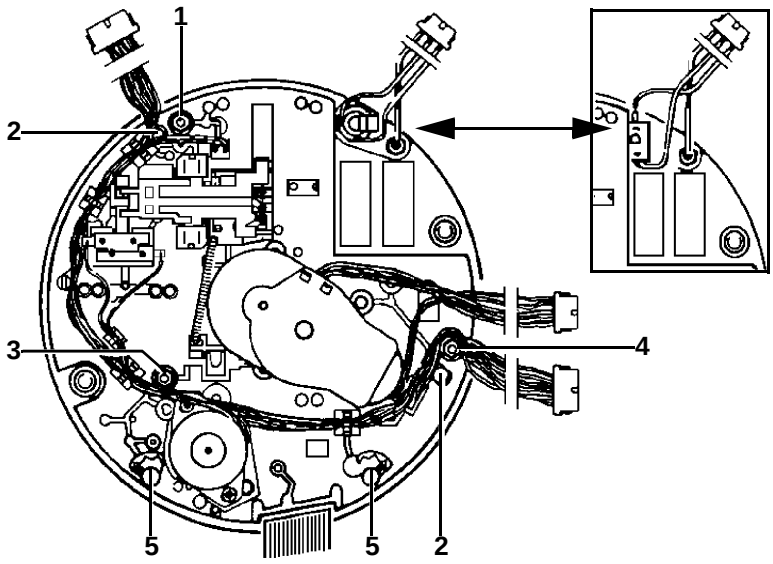

Fig. 3-45 Installing frame

1 Threaded pin
2 Frame stud
3 Threaded pin
4 Threaded pin
5 Stop spring

3.16.1.1 Checking frame before installation

! Note

Before you fit the frame plate make a visual check of the front and back.

Checking that frame is complete and works properly

- ✓ Stylus unit engaged
- ✓ Tension springs painted
- ✓ Stylus carriage and gears are running smoothly.
- ✓ Stop spring (5) setting.
- ✓ Cables laid correctly
- ✓ The rocker is seated properly

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3.16.1.2 Installing frame

Note

- The frame is finely centred by the two housing studs (2).
- Ensure that the connection parts engage correctly when you turn the knobs. If necessary correct this.

❍ **Open the housing cover.**

❍ **Insert the whole frame so that the 3 threaded pins (1), (3) and (4) on the housing extend into the guide sockets.**

❍ **Push the frame in until it reaches the stop.**

❍ **Fix the frame plate to the housing at positions (1), (3) and (4) using the M4 hexagonal nuts.**

3.16.2 Adjusting the contact set for warning device

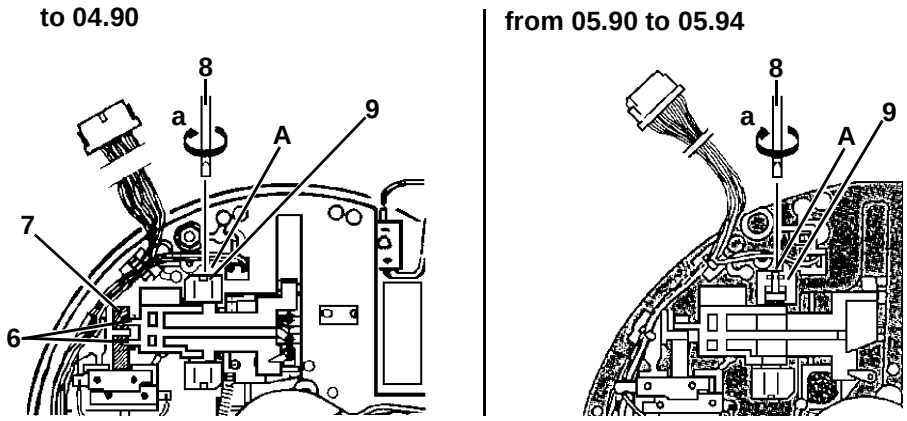

Fig. 3-46 Adjusting the contact set for warning device

6	Lugs	**8**	Screwdriver
7	Contact spring	**9**	Bearing bracket

Procedure

❍ **Insert adjustment discs for driver 1and 2.**

❍ **Close the housing cover.**

❍ **Turn the eccentric shaft in the bearing (9) in the direction of the arrow (a) to position (A) using a watchmaker's screwdriver until the lugs (6) are flush with the contact spring(7)**
.

Check

✓ When the unit cover is closed and the diagram charts inserted the contact must be open.

✓ When the unit cover is open and there are no diagram charts the contact must be closed.

❍ **Secure the eccentric shaft in the bearing bracket (9) with paint at position (A).**

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3.16.3 Default setting for driver 2 coupling

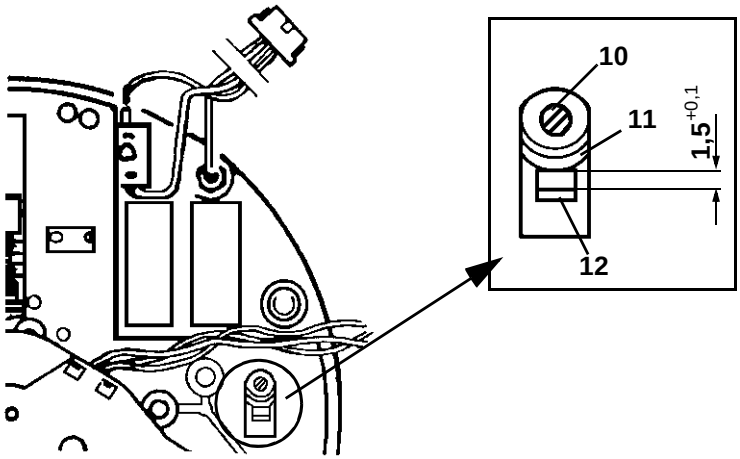

Fig. 3-47 Default setting for driver 2 coupling

10 Screw
11 Plastic part
12 Coupling lever

Procedure

- ❍ **Open the housing cover.**
- ❍ **Undo the screw (10) slightly.**
- ❍ **Set a gap of 1.5 mm between the coupling lever (12) and the plastic part (11).**
- ❍ **Tighten the screw (10).**

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3.16.4 Fitting n board

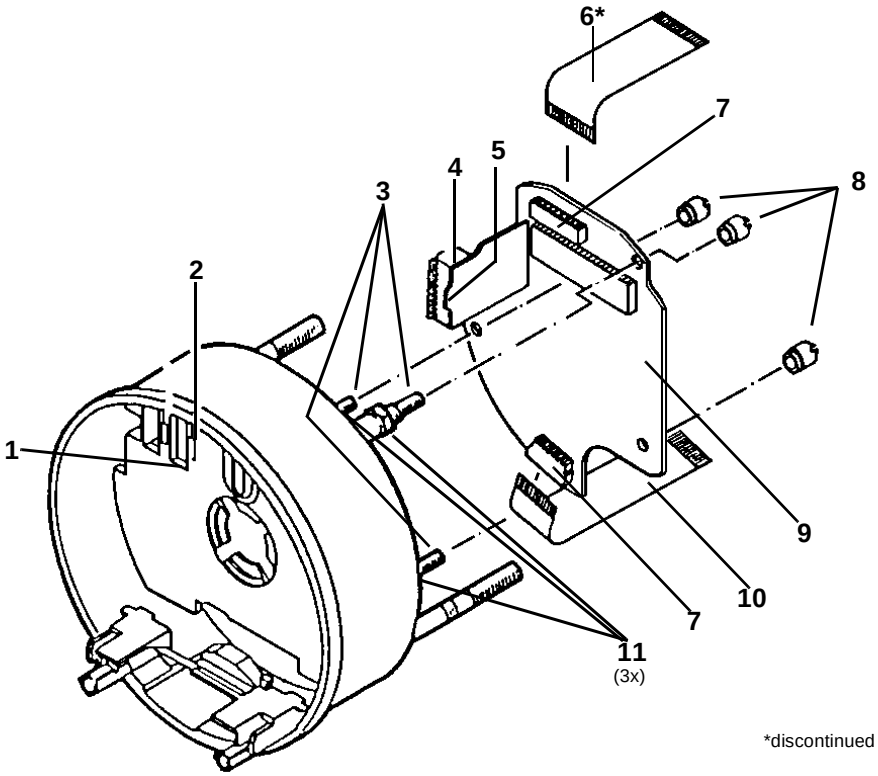

Fig. 3-48 Fitting n board onto back of housing

1	Housing cut out	**7**	Multiple pin strip
2	Recess	**8**	Spacer
3	Threaded pin	**9**	n board
4	Coding switch group	**10**	Flat cable *
5	Centring lug	**11**	Hexagonal nuts
6	Flat cable *		

! Note

With installing ensure that

- the coding switch (4) is located in the housing cut out (1).
- the centring lug (5) is located in the recess (2).

Procedure

- ❍ **Put the spacer (8) on the n board (9).**
- ❍ **Put the flat cable (6) into the n board (9) multi pin strips (7).**
- ❍ **Put the flat cable (10) into the n board (9) multi pin strips (7).**
- ❍ **Push the n board (9) onto the three threaded pins (3).**

The n board (9) is on top of the hexagonal nuts (11) on the 3 threaded pins (3).

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3.16.5 Fitting v board

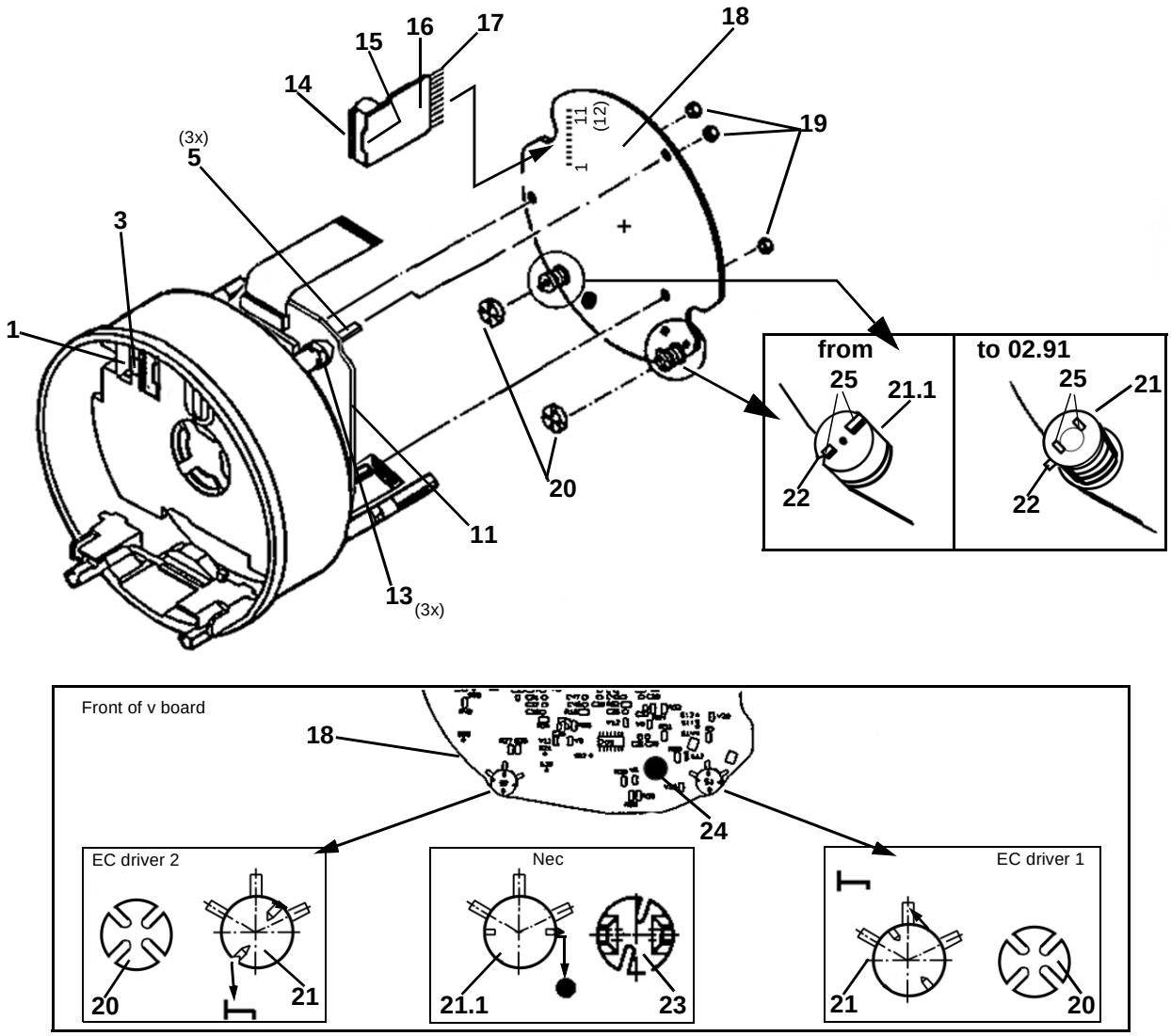

Fig. 3-49 Fitting v board to back of housing

1	Housing cut out	18	v board
3	Recess	19	Hexagonal nuts
5	Threaded pin	20	Driver plates
11	n board	21	Working time switch (to 02.91)
13	Hexagonal nuts	21.1	Working time switch (from 03.91)
14	Coding switch	22	Lug (up to 02.91) / groove (from 03.91)
15	Centring lug	23	NEC driver plate
16	Coding plate	24	Motor axle feed through
17	Pole 12 on coding plate	25	Lugs

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! Note

The side of driver 1's working time switch can be recognised by the nearby hole from the WT motor to the v board (24) for the axle.

Procedure

❍ **Insert the coding plate (15) into the v board (18).**

When doing this note whether it is an 11 or 12 pin version and the details, e.g. 1 … 12 on the v board (18) and the coding plate (15). If necessary remove pin 12 (17).

❍ **Adjust the working time switches (21/21.1) for driver 1 so that the lug/ groove (22) points away from the middle point of the v board.**

❍ **Adjust the working time switches (21/21.1) for driver 2 so that the lug/ groove (22) points towards the middle point of the v board.**

❍ **Insert the driver plates (20) in this position.**

With NEC units use the working time switch (21.1) with driver plate (23).

❍ **Put the v board (18) on the spacer behind the n board (10).**
When doing this ensure that:

✓ The coding switch (14) is located in the housing cut out (1) and the coding plate (16) centring lug (15) is in the cut out (3).

✓ The driver plates (20) engage with the bolt (28) on the frame plate (27). (see Abb. 2-50).

Driver plates (20) must be able to move slightly. Bolts (28) belong to the stop springs (26) on the frame plate.

❍ **Turn the hexagonal nuts (18) by hand on the threaded pins (5).**

❍ **Check that the knobs snap on properly.**

❍ **Tighten the hexagonal nuts (18) with a socket spanner.**

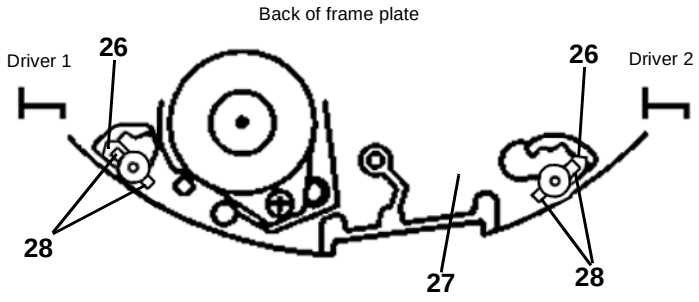

Fig. 3-50 Fitting v board Detailed view of frame plate

26 Stop spring
27 Frame plate
28 Bolts

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3.16.5.1 2 driver EC v board in 1 driver unit

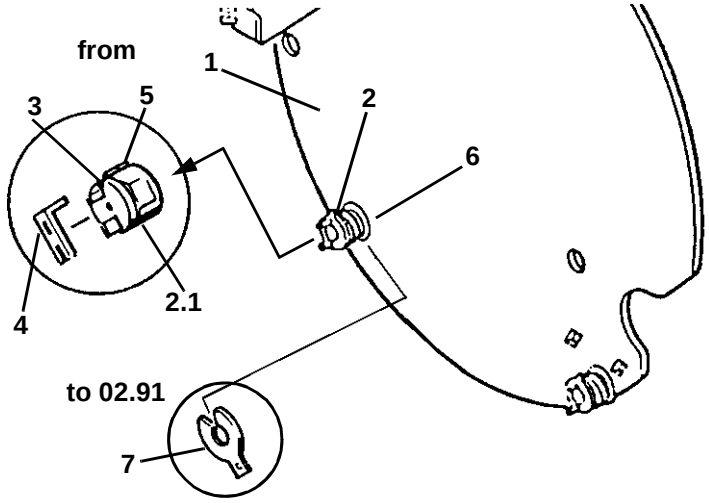

Fig. 3-51 2 driver EC v board in 1 driver unit

1	v board	**4**	Catch
2	Working time switch (to 02.91)	**5**	Lug
2.1	Working time switch (from 03.91)	**6**	Contact disc
3	Groove	**7**	Insulating washer

Action to be taken when inserting a 2 driver EC v board into a 1 driver unit

- ❍ **Up to 02.91 insert the insulating washer (7) between the v board (1) and the contact disc (6).**

—— **or** ——

- ❍ **From 03.91 with v boards with the working time switch (2.1) use the catch (4).**
- ❍ **Line the groove (3) up with the lug (5).**
- ❍ **Press the catch (4) down completely.**

Working time switch (2.1) is fixed to the catch (4).

3.16.5.2 2 driver NEC v board in 1 driver unit

! Note

The measures to be taken when inserting a NEC v board are important because otherwise information would be incorrect when data is output.

For measures to be taken when inserting see Chapter3.16.5.1.

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3.16.6 Laying cables, making electrical connections

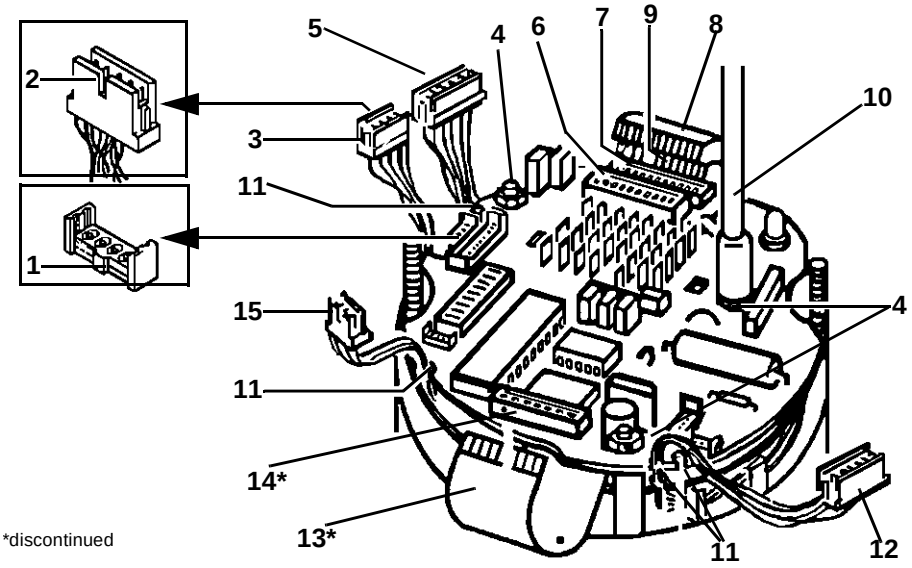

Fig. 3-52 Laying cables, making electrical connections

1	Lug	**9**	Flat cable (16 pin)
2	Recess	**10**	Socket spanner
3	5 pin socket housing	**11**	Recess
4	Nuts	**12**	6 pin socket housing
5	6 pin socket housing	**13**	Flat cable (8 pin) *
6	Socket connector	**14**	Socket connector *
7	Socket connector	**15**	3 pin socket housing
8	Flat cable (16 pin)		

! Note

The socket housings are coded by the recess (2) and the lug located on the socket connector (1). Thus it is not possible to insert them in the wrong side.

Procedure

- ❍ **Put socket housings (3), (5), (12) and (15) into the correct socket housings.**
- ❍ **With 16 pin units put the flat cable (8) into the socket housing (6).**

With µP pin units and rpm units the flat cable (8) is 16 pin.

- ❍ **Put flat cable wires (9) and (13) into socket housings (7) and (14).**
- ❍ **Thread the wires into the recesses (11) and lay them properly.**

3.16.7 fixing v and n boards

Procedure

- ❍ **Tighten the 3 nuts (4) with a socket spanner (10).**

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3.16.8 Fitting the lug holder and lug

3.16.8.1 Fitting the lug for warning device (up to 09.87)

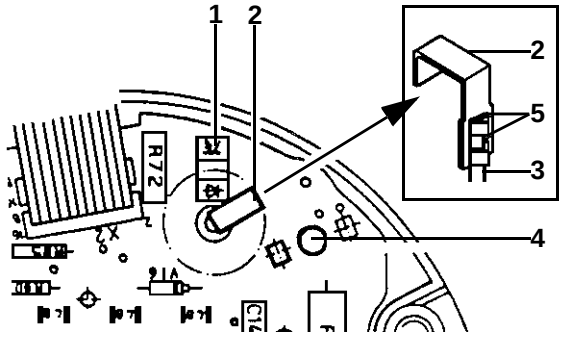

Fig. 3-53 Fitting lug for warning device

1 Light barrier
2 Lug
3 Motor shaft
4 Data output LED

Fitting without lug holder

- **Put the lug (2) on the motor shaft (3) until it locks into place.**
- **Line the lug (2) up so that it can pass through the light barrier (1) unhindered.**
- **Secure the lug (2) with securing paint in area (3).**

3.16.8.2 Fitting the lug holder

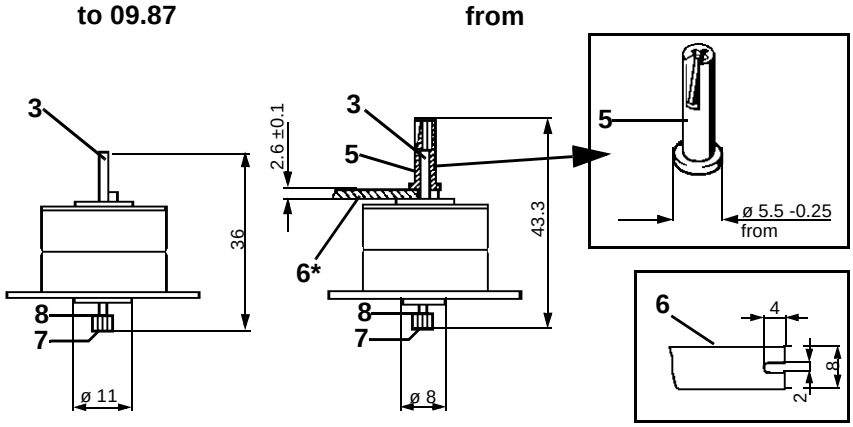

Fig. 3-54 Fitting lug holder for warning device

3 Motor shaft
5 Lug holder
6 Auxiliary tool
Not available –in house production
7 Shaft end
8 Pinion

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! Note

Check that the motor pinion (8) is firmly seated after pressing the lug holder (5) down.

Procedure

- ❍ **Remove the remains of paint sticking to the motor shaft (3).**
- ❍ **Put the motor shaft (3) on the shaft end (7) on a firm base.**
- ❍ **Press the lug holder (5) onto the motor shaft (3) until its size is 2.6 mm .**

In order to prevent pressing it down to far, insert the auxiliary tool (6) not available in house production) as shown.

3.16.8.3 Putting the lug onto the lug holder

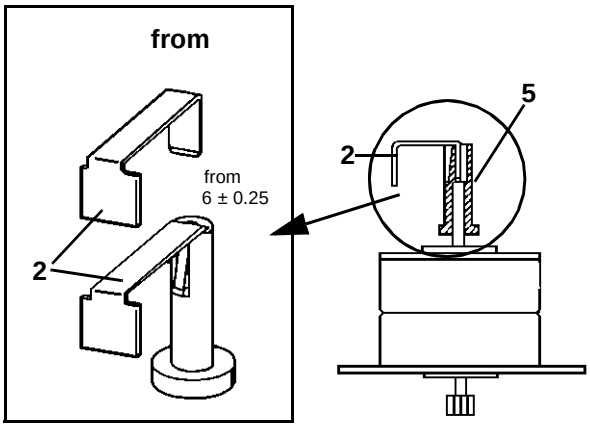

Fig. 3-55 Putting lug onto lug holder

2 Lug **5** Lug holder

Procedure

- ❍ **Put the lug (2) onto the lug holder (5).**
- ❍ **An additional retaining device is not necessary.**
- ❍ **Line the lug (2) up so that it can pass through the light barrier unhindered.**

See Abb. 2-53, item (2).

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3.16.9 Plug unit and trough connector

3.16.9.1 Fitting plug unit/ data output and trough connector to v board

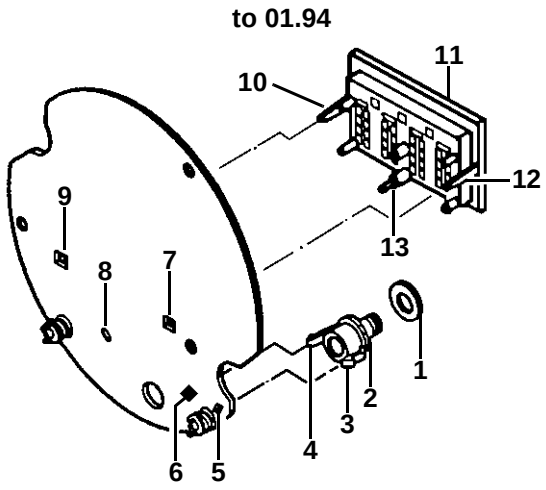

Fig. 3-56 Fitting plug unit and trough connector

1	Sealing ring	**8**	Recess
2	Plug unit	**9**	Recess
3	Catch lug	**10**	Catch lugs
4	Catch lug	**11**	Trough connector
5	Recess	**12**	Catch lug
6	Recess	**13**	Pin
7	Recess		

Procedure

- ❍ **Fit the plug unit (2) into the v board:**
  Engage catch lugs (3) and (4) into recesses (5) and (6).
- ❍ **Place the sealing ring (1) onto the plug unit (2).**
- ❍ **Fit the plug unit (11) into the v board:**
  Engage catch lugs (10) and (12) and pin (13) into recesses (7), (8) and (9).

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3.16.9.2 Hood with integral trough connector

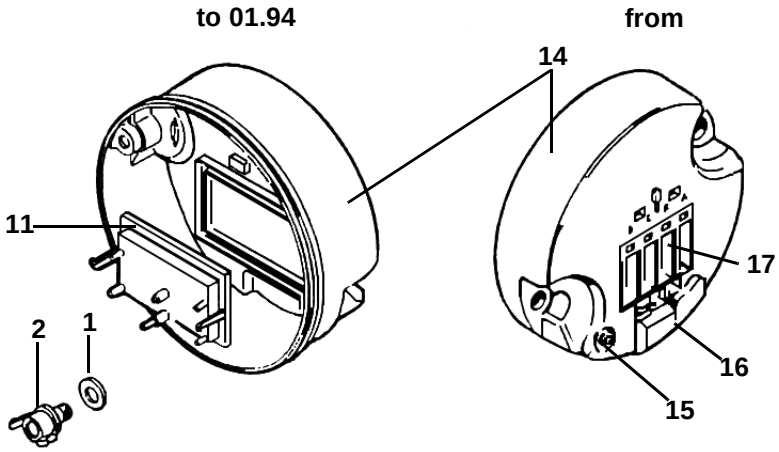

Fig. 3-57 Hood with integral trough connector from 02.04

1	Sealing ring	**15**	Plug unit incorporated (from 02.94)
2	Plug unit	**16**	Bead
11	Trough connector	**17**	Trough connector incorporated (from 02.94)
14	Hood		

Remark

- With µP units fit the hood (14) with the bead (16).
- The hood (14) is compatible with earlier 1318 versions.

Modified since 02.94

☞ Trough connector (11) and plug unit (2) incorporated into the hood (14) with sealing ring (1).
(See items (15) and (16).

Procedure

❍ **When using visual data output in the integral plug unit (15) drill through a thin moulded skin.**

❍ **Turn the grooved (ø 3 mm) bit by hand so that the shavings produced fall out.**

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3.16.9.3 Preventing access - modified hood (from 03.99)

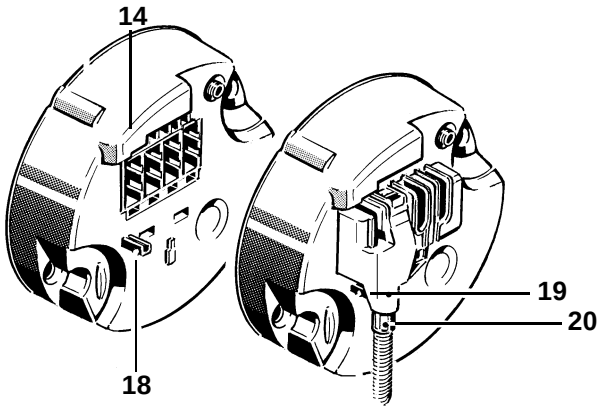

Fig. 3-58 Hood modification (from 03.99)

14 Hood
18 Stop
19 Sealing hood - armoured cable
20 Armoured cable

Modified since 03.99

☞ The stop (2) was moulded onto the hood (14).

Remark

With the sealing hood armoured cable (19) the stop (2) prevents the armoured cable (20) from being forcibly hanged out.

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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3.17 Data output – data block

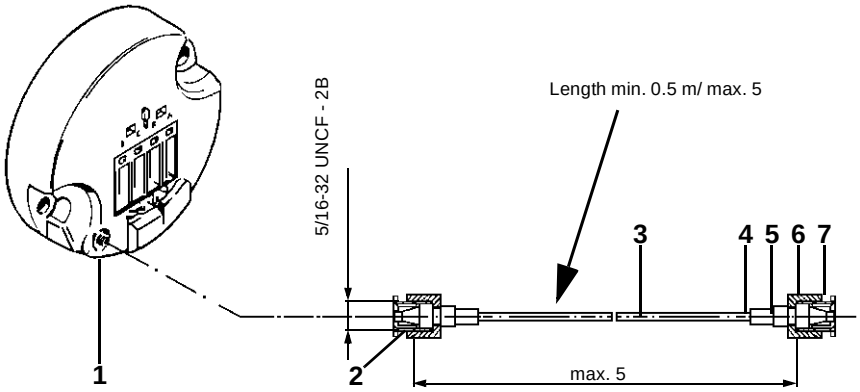

Fig. 3-59 Data output and optical fibre

1	Data interface	**5**	Crimp ring
2	Optical fibre cable	**6**	Screw cap
3	Optical fibre	**7**	Seal die
4	Sleeve (red)		

From 09.85 all 1318 units have been fitted with an optical, serial data interface (1). Data carriers are transmitted to the receiver by means of a fibre optic cable (2) with the smallest bend radius of 50 mm.
The data output LED works in the visible area. (See Abb. 2-53 item (4)).)

Data format	Transmission interval
5 x 8 bit, UART compatible, 300 baud, phase coded	**0.5 seconds**

Within the transmission interval one data block is transmitted with the speed unit and two data blocks with the RPM unit. These data blocks have the following content.

Data block 1	Data block 2
• Distance pulses (v speed) • Current statuses – Switch position for knobs – Additional stylus – Warning device – System identification for v • Sender unit pulse check for v • CRC test symbol	• RPM n • System identification n • Generator pulse check for n • CRC test mark

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Section 4 Checking and adjusting

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4 Contents and assignment

Contents/Assignment		Fig.	EC Tacho-graphs -24	-25	-26	-27	NEC Ta-cho-graphs -02	-04	-06	NEC Tacho-graphs CH -01	-03	-05	Page
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4.1	Adjustment tool for styluses and coupling levers (from 01.02)	Abb. 4-1	o	o	o	o	o	o	o	o	o	o	2-3
4.2	Checking and correcting position of speed recording	Abb. 4-2	o	o	o	o	o	o	o	o	o	o	2-4
4.2.1	Checking speed stylus	Abb. 4-2	o	o	o	o	o	o	o	o	o	o	2-4
4.2.2	Correcting speed recording	Abb. 4-3 Abb. 4-4	o	o	o	o	-	-	-	-	-	-	2-5
4.2.3	Checking and adjusting speed recording for speed dial	Abb. 4-5 Abb. 4-6	-	-	-	-	o	o	o	-	-	-	2-6
4.3	Checking and adjusting position of working time recording for Driver 1	Abb. 4-7 Abb. 4-8	-	-	-	-	-	-	-	o	o	o	2-8
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4.5	Checking and correcting position of distance recording	Abb. 4-9 Abb. 4-10	-	-	o	o	-	-	-	-	-	-	2-12
4.6	Checking and adjusting position of Driver 2 working time recording	Abb. 4-11 Abb. 4-12	-	o	o	-	-	o	-	-	o	-	2-14
4.7	Checking and adjusting RPM recording	Abb. 4-13 Abb. 4-14 Abb. 4-15 Abb. 4-16	o	o	o	o	o	o	o	o	o	o	2-18
4.8	Adjusting unit test bench display	Abb. 4-17 Abb. 4-18	o	o	o	o	o	o	o	o	o	o	2-21
4.9	Adjusting unit to test bench display	Abb. 4-20	-	o	o	-	-	o	-	-	o	-	2-22
4.9.1	Speed calibration adjustment (km/h, mph)	Abb. 4-20	-	o	o	-	-	o	-	-	o	-	2-23
4.9.2	RPM calibration adjustment (1/min, rev/min)	Abb. 4-19	-	o	o	-	-	o	-	-	o	-	2-23
4.10	Function check		o	o	o	o	o	o	o	o	o	o	2-24

Key

- **not available**

o **optional**

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4.1 Adjustment tool for styluses and coupling levers (from 01.02)

Fig. 4-1 Adjustment tool

! Note

Note the different diameters of the adjustment tool.

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4.2 Checking and correcting position of speed recording

4.2.1 Checking speed stylus

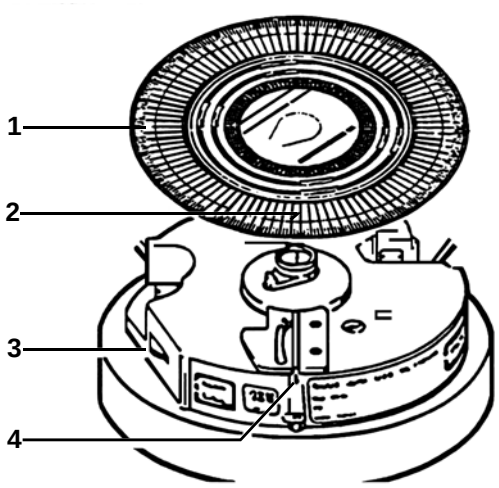

Fig. 4-2 Inserting adjustment disc

1 Adjustment disc
2 Line
3 Indicator setting wheel
4 Marking

Procedure

- ❍ **Insert the adjustment disc (1)[1].**
- ❍ **Turn the indicator setting wheel (3) until a line (2) running to the middle point on the adjustment disc (1) corresponds with the marking.**
- ❍ **Close the housing cover.**
- ❍ **Connect the unit to the electricity and drive it briefly on the test bench.**

The v measuring system runs automatically to the end stop and then returns again to the initial position. The recording made (7), Abb. 4-3, when doing this must run parallel to the printed line (2)Abb. 4-2. If this is not the case please refer to Chapter "4.2.2 Adjusting speed stylus".

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4.2.2 Correcting speed recording

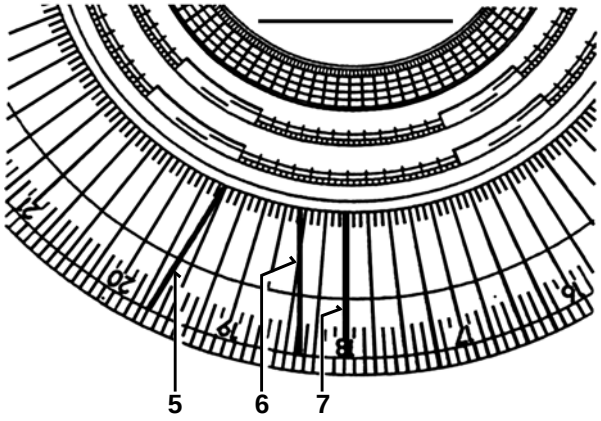

Fig. 4-3 Checking speed recording

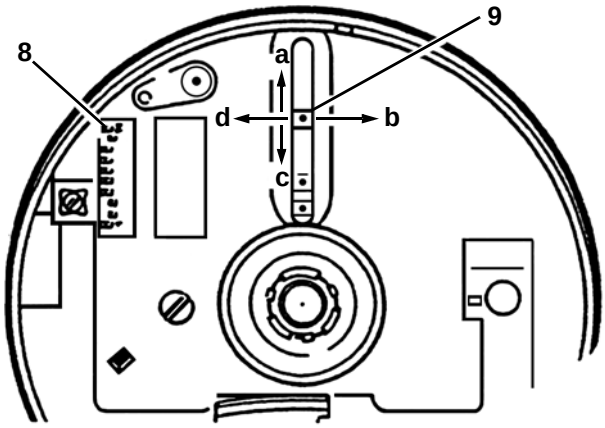

Fig. 4-4 Adjusting speed stylus

5 Recording
6 Recording
7 Recording
8 Coding switch cover
9 Speed stylus

Remark

- **The speed stylus** must be corrected if the recording on the adjustment disc differs from the recording (7).
- As the stylus holders are bonded with special aids only fine adjustments are necessary.

Correcting

❍ **Should the speed stylus (9) recording (5) be in the direction of the arrow (d), Abb. 4-4, correct it.**

❍ **Should the speed stylus (9) recording (6) be in the direction of the arrow (b), correct it.**

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4.2.3 Checking and adjusting speed recording for speed dial

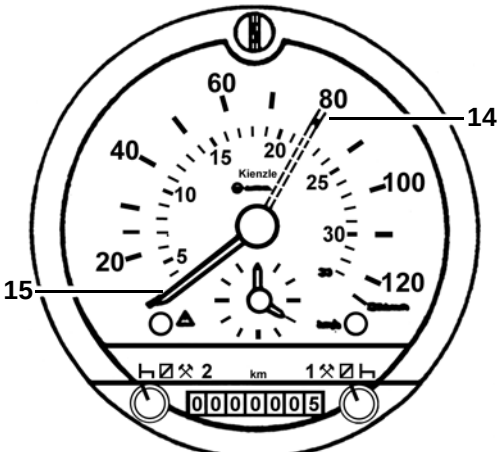

Fig. 4-5 Checking speed dial for speed recording

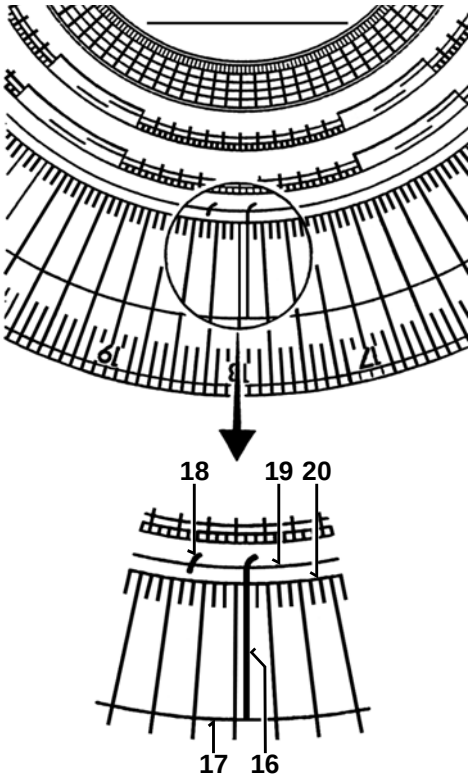

Fig. 4-6 Checking speed recording

14 Marking
15 Speed indicator
16 Recording
17 Adjustment circle
18 Closing mark
19 Line
20 Line

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Procedure

- ❍ **Turn the indicator setting wheel (3) until the marking (4) Abb. 4-2 is located between the two lines (2).**
- ❍ **Set the coding switch (8), Abb. 4-4, to k = 8000 imp/km with switches 2,3 and 9.**

See Section 7, "Setting coding switch"

- ❍ **Close the housing cover.**
- ❍ **Run the unit on the test bench until the speed indicator (15), Abb. 4-5, points exactly to the marking (14).**

The recording (16) must end on the adjustment circle (17) The end of the close marking (18) must be between lines (19) and (20).

Remark

- **The speed stylus** must be corrected if the speed recording is not as in Abb. 4-6.
- Do not modify the speed stylus on the edges any more.

Correcting

- ❍ **Using the adjustment tool press the speed stylus (10), Abb. 4-4, in the direction of the arrow (a) if the recording is too low or (c) if the recording is too high.**

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4.3 Checking and adjusting position of working time recording for Driver 1

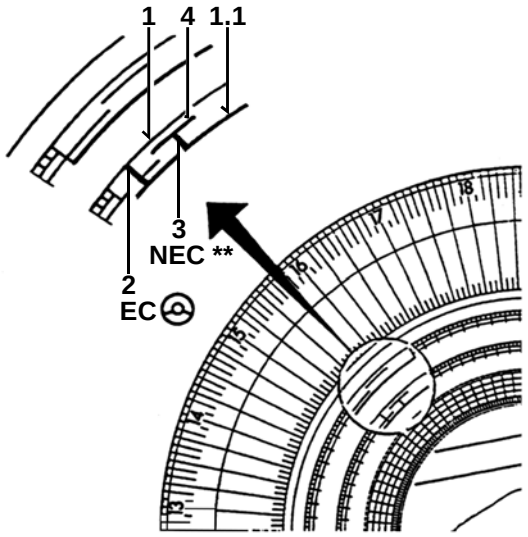

Fig. 4-7 Checking working time recording

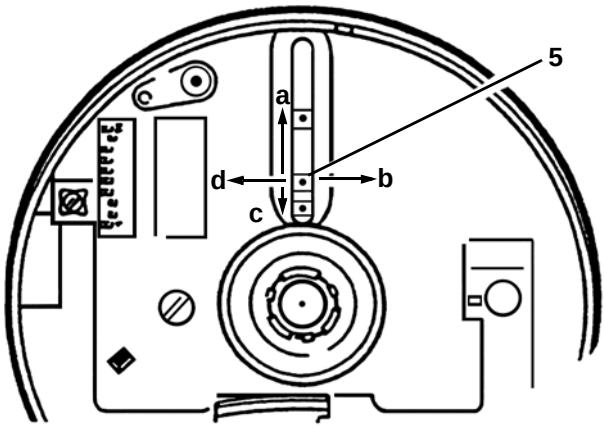

Fig. 4-8 Adjusting working time stylus

2 EC driving time

3 NEC driving time

5 Working time stylus

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Procedure

- ❍ **Insert the adjustment disc[1].**
- ❍ **Close the housing cover.**
- ❍ **Set the Driver 1 knob to position " ▨ " or " ⚒ ".**
- ❍ **Run the unit on the test bench.**

The recording made (2) ⍾ when doing this must be between lines (1) and (1.1) and must be aligned with the speed recording.

Remark

The working time stylus must be corrected if the recording (2) is not as in Abb. 4-7.

Correcting

- ❍ **Using the adjustment tool press the working time stylus (5), Abb. 4-8, in the direction of arrow (a) or (c) or (b) or (d).**

*4.3.1 Checking and adjusting working time recording with NEC ** 1318-02, -04, -06.*

Note

"A01" driver change units must be adjusted in the same way . However, the knob must be in position " • ".

Procedure

- ❍ **Insert the adjustment disc *.**
- ❍ **Close the housing cover.**
- ❍ **Run the unit on the test bench.**

The recording made (3) when doing this must end on line (4) and be aligned with the speed recording. (See Fig. 4-7)

Remark

The working time stylus must be corrected if the recording (3) is not as in Abb. 4-7.

Adjusting

- ❍ **Using the adjustment tool press the working time stylus (5), Abb. 4-8, in the direction of arrow (a) or (c) or (b) or (d).**

1 1900.1501.054.030

NEC = Non EC

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4.4 Checking and adjusting CH working time recording

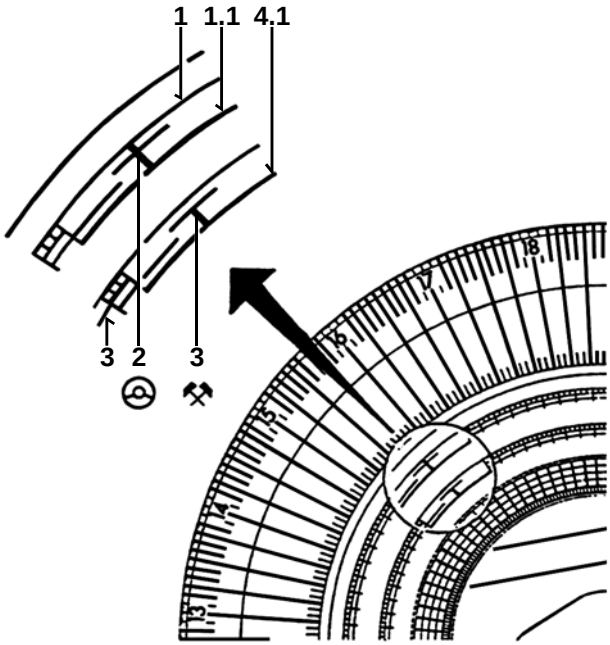

Fig. 4-9 Checking CH working time recording

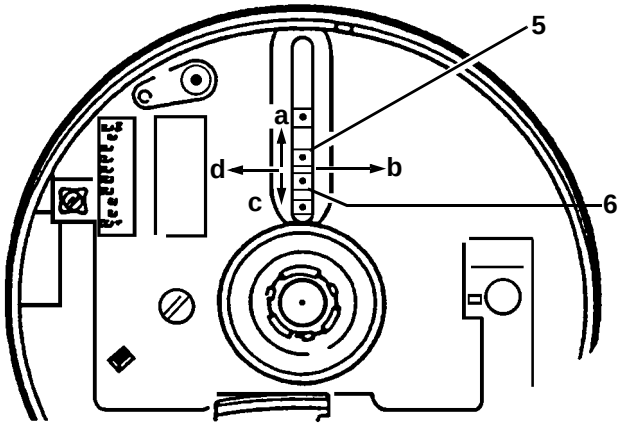

Fig. 4-10 Adjusting CH working time stylus

2 Driver 1 recording
3 Driver 2 recording
5 Driver 1 stylus
6 Driver 2 stylus

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Procedure

- **Insert [1] the adjustment disc.**
- **Close the housing cover.**
- **Set the Driver 1 knob to position " ⍟ " and Driver 2 knob to position "⚒".**
- **Run the unit on the test bench for about 30 seconds.**

When doing this the Driver 1 recording (2) should be between lines (1) and (1.1). Driver 2 recording (3) should be between lines (4) and (4.1).

Remark

The CH working time styluses must be corrected if recordings (2) and (3) are not as in Abb. 4-9.

Correcting

- **Set the Driver 1 and Driver 2 knob to position " ⊢ ".**
- **Using the adjustment tool press the Driver 1 stylus (5) in the direction of arrow (a) or (c).**
- **Using the adjustment tool press the Driver 2 stylus (6) in the direction of arrow (a) or (c).**
- **If Driver 1 and Driver 2 recordings are not aligned with the speed recording, correct the Driver 1 stylus (5) and Driver 2 stylus (6) in the direction of arrow (7) or (9).**

1 1900.1501.054.030

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4.5 Checking and correcting position of distance recording

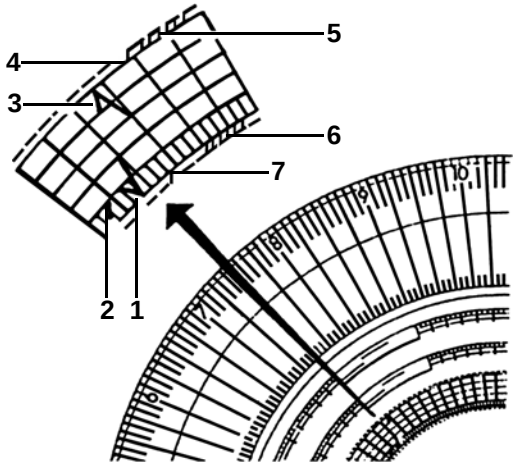

Fig. 4-11 Checking distance stylus recording

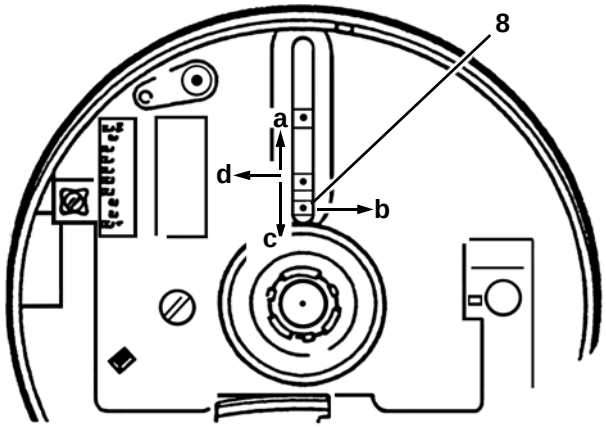

Fig. 4-12 Adjusting distance stylus

1 Reversing point
2 Distance stylus marking
3 Reversing point
4 Tolerance field
5 Tolerance field
6 Distance stylus

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Note

Adjust the reversing point as accurately as possible.
In this way you will guarantee that the permissible tolerance fields (5) and (6), Abb. 4-11, are adhered to over the whole range of the adjustment disc.

Procedure

- **Insert [1] the adjustment disc.**
- **Close the cover and open it again.**
- **Check the position of the distance stylus marking (2).**

As the position of the distance cam is not known, run the unit on the test bench until reversing point (1) or (3) is reached.
Reversing point (1) must end on line (7) and reversing point (3) on line (4).

Remark

The distance stylus must be corrected if the distance stylus marking (2) is not aligned with the speed and working time recording and the reversing points (1) and (3) are not as in Abb. 4-9.

Correcting

- **Using the adjustment tool press the distance stylus (8) in the direction of arrow (a) or (c)**
  to correct the reversing points.
- **Using the adjustment tool press the distance stylus (8) in the direction of arrow (9) or (10)**
  to correct the distance stylus marking.

1 1900.1501.054.090

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4.6 Checking and adjusting position of Driver 2 working time recording

Procedure

- ❍ **Insert the adjustment disc*.**
- ❍ **Close the housing cover and turn the power on.**
- ❍ **Turn the Driver 2 knob to position " ⚒ ".**
  - ▶ **Let the unit record for about 30 seconds.**

The recording made (1), Abb. 4-13, while doing this must be between lines (2) and (2.1).

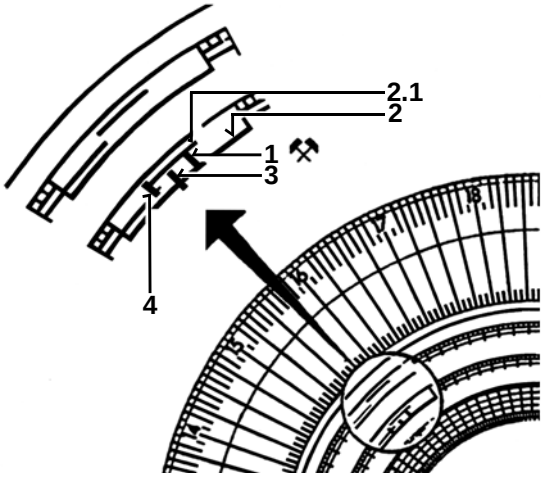

Fig. 4-13 Checking Driver 2 recording

1 Recording correct

3 Recording too low

4 Recording too high

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Remark

The coupling lever must be corrected if the recording (1) is not between lines (2) and (2.1) and recordings (3) and (4) are not as in Abb. 4-13.

- Only a **small** correction is permissible on the coupling lever (6).
- Larger deviations must be corrected on the adjustment screw (11) on the back of the outsert board, Fig. 4-15.

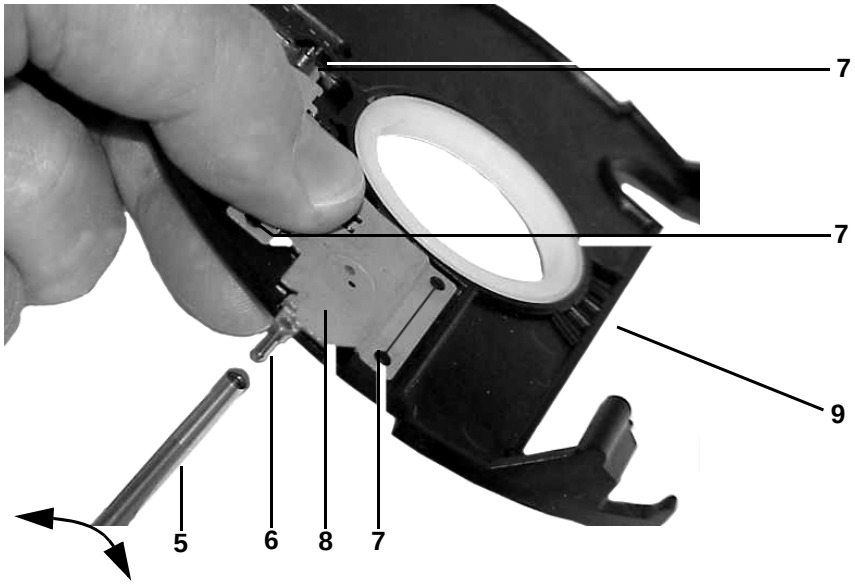

Fig. 4-14 Adjustment tool

2 Adjustment tool
3 Coupling lever
4 Ultrasound welding heads
5 Coupling
6 Separating plate

Damage

Note

Damage occurs when bending forces are applied to the coupling:

- Heads split at the ultrasound welding point (7).

Action to be taken:
Grip the separating plate (9) at coupling level (8) firmly between your thumb and index finger.

For order numbers please refer to the 1318 Electronic Product Catalogue (EPC).

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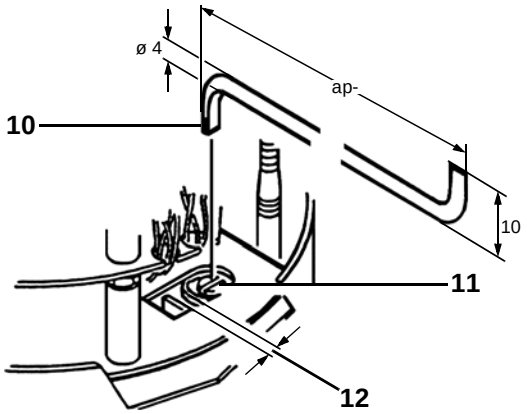

Fig. 4-15 Adjusting coupling lever

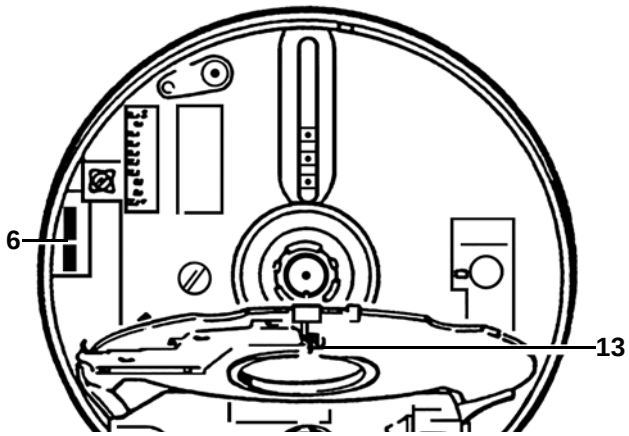

Fig. 4-16 Adjusting coupling lever

6 Coupling lever
7 Allen key
8 Adjusting screw
9 Gap
10 Stylus

! Note

The edges of the coupling lever (8) must not rub on the housing.

Correcting

- ❍ **Turn the Driver 2 knob to position " ⚒ ".**
- ❍ **Open the housing cover.**
- ❍ **If the recording (3) is too low:**
  Using the Allen key (10) loosen the adjusting screw (11), reduce the gap (12) and tighten the adjustment screw (11) again.
- ❍ **If the recording (4) is too high:**
  Using the Allen key (10) loosen the adjusting screw (11), increase the gap (12) and tighten the adjustment screw (11) again.
- ❍ **To check this record for about 30 seconds again.**

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4.7 Checking and adjusting RPM recording

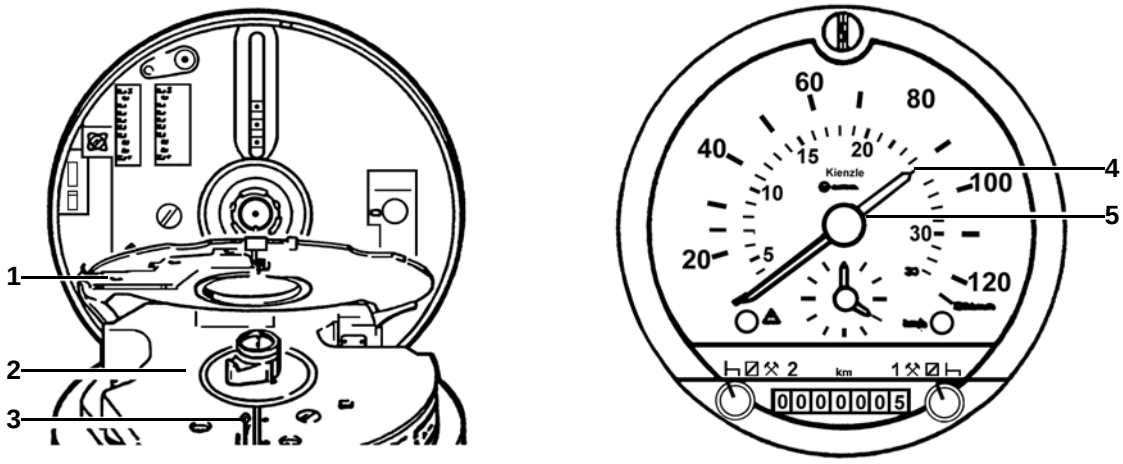

Fig. 4-17 Inserting adjustment disc / Checking RPM dial for recording

1 Separating plate
2 Unit cover
3 RPM stylus
4 Marking
5 RPM indicator

Procedure

❍ **Insert [1] the RPM adjustment disc.**

The front (6), Abb. 4-18, must point towards the unit cover.

❍ **With 1 and 2 driver units close the separating plate (1) and insert the adjustment or blank chart above the plate.**

❍ **Close the housing cover.**

❍ **Connect the unit to the electricity and drive it on the test bench with pulses.**

The RPM indicator (5) must point exactly to the marking (4), Abb. 4-17.
Recording (7), Abb. 4-18, must begin between lines (9) and (10) and end at the adjustment circle (8).

1 1900.1501.064.000

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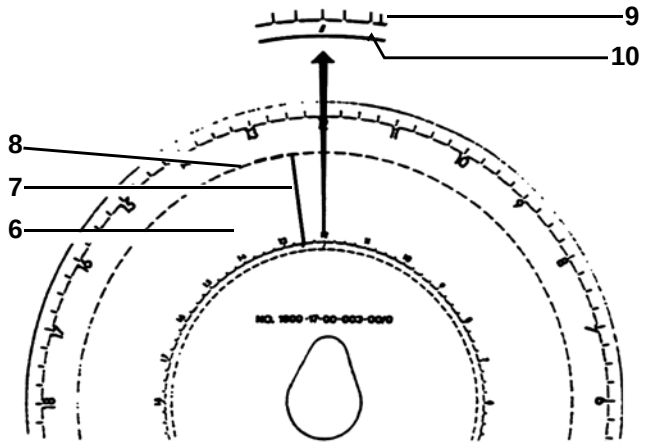

Fig. 4-18 Checking RPM recording

6 Network side
7 Recording
8 Adjustment circle

Remark

The RPM stylus must be corrected if the recording (7) is not as in Abb. 4-18 and the RPM indicator (5) does not point to the marking (4).

Correcting

- **Switch on the power.**
- **Using tweezers correct the RPM stylus (3), Abb. 4-17.**
- **Record again (7) and correct if necessary.**

Note

If you cannot position it correctly check the operations to be done in Chapter 2.11.7 "Inserting spur gears on the n measuring system" and in Chapter 2.12.3 "Fitting n and v indicators".

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4.8 Adjusting unit test bench display

4.8.1 Speed calibration adjustment (km/h, mph)

Procedure

- ❍ **Set the coding switch (8), Fig. 4-4, to k = 8000 imp/km with switches 2,3 and 9.**

See Section 7, "Setting coding switch"

- ❍ **Insert the tachograph chart(s) and close the unit cover.**
- ❍ **Connect the unit to the electricity and drive it on the test bench.**
- ❍ **Increase the test bench drive rpm slowly and evenly until the end of the scale is reached and turn it back slowly.**

The speed indicator should follow evenly and without a noticeable delay.

- ❍ **Depending on the unit's nominal value, set speed adjustment 1 on the test bench and adjust the unit display to the adjustment value using a potentiometer (1).**
- ❍ **Set speed adjustment 2 on the test bench and adjust the unit display to the adjustment value using a potentiometer (2).**
- ❍ **Repeat the adjustment procedure until the adjustment values match.**

4.8.2 Modifying speed calibration adjustment (from 07.98)

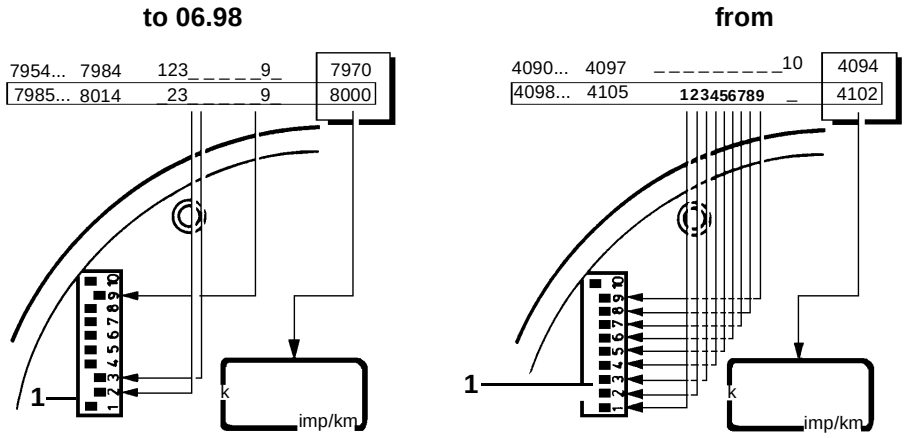

Fig. 4-19 Modifying the speed calibration adjustment (from 07.98)

1 Coding switch

Standard since 07.98. The adjustment table remains valid in its unmodified condition. The RPM coding switch setting remains as before.

Modification

☞ All switches are switched on except for number (10).

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4.9 Adjusting unit to test bench display

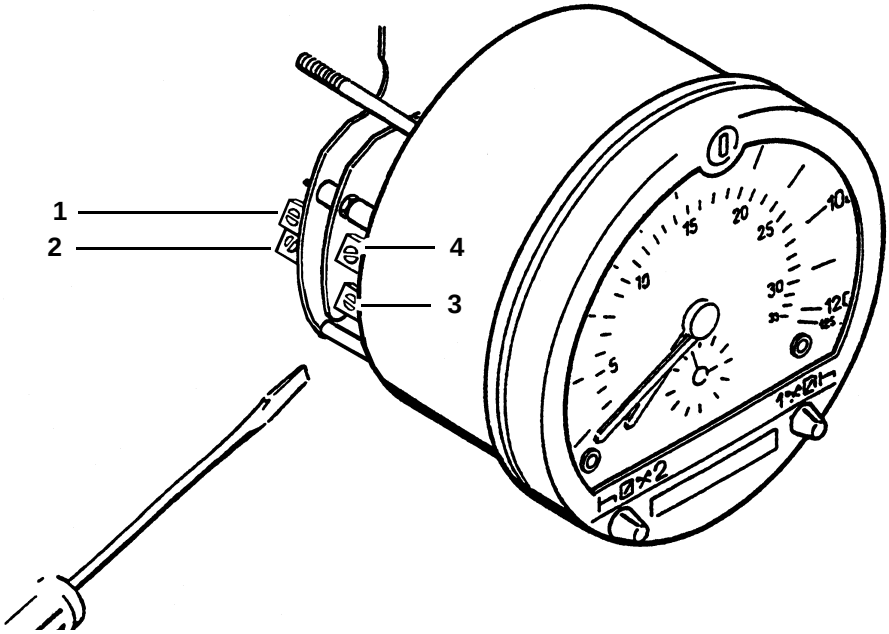

Fig. 4-20 Speed / RPM calibration adjustment

1 Potentiometer for speed adjustment 1 (v)

2 Potentiometer for speed adjustment 2 (v)

3 RPM adjustment potentiometer 1 (n)

4 RPM adjustment potentiometer 2 (n)

	Speed adjustments							
	Nominal unit value	**km/h, mph**	**80**	**100**	**125**	**140**	**160**	**180**
Potentiometer 1	**Speed adjustment 1**	**km/h, mph**	**20**	**20**	**30**	**30**	**40**	**50**
Potentiometer 2	**Speed adjustment 2**	**km/h, mph**	**70**	**90**	**110**	**120**	**140**	**160**

	RPM adjustment					
	Nominal unit value	**1/min (rev/min)**	**2500**		**3300**	
			Test bench	**Unit**	**Test bench**	**Unit**
Potentiometer 3	**RPM adjustment 1**	**1/min (rev/min)**	**300 (300)***	**600 (600)**	**400 (500)***	**800 (1000)**
Potentiometer 4	**RPM adjustment 1**	**1/min (rev/min)**	**1100 (1000)***	**2200 (2000)**	**1350 (1500)***	**2700 (3000)**

* required with "70" additional equipment

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4.9.1 Speed calibration adjustment (km/h, mph)

- **Set the speed coding switch to k = 8000 imp/km (switches 2, 3 and 9).**
- **Insert the tachograph chart(s) and close the unit cover.**
- **Connect the unit to the electricity with connection wire "A" and connect wire "B" to drive it on the test bench.**
- **Increase the test bench drive rpm slowly and evenly until the end of the scale is reached and turn it back slowly.**
  The speed indicator should follow evenly and without a noticeable delay.
- **Depending on the unit's nominal value, set speed adjustment 1 on the test bench and adjust the unit display to the adjustment value using a potentiometer (1).**
- **Then set adjustment speed 2 on the test bench and adjust the unit display to the adjustment value using a potentiometer (2).**
- **Repeat the adjustment procedure until the adjustment values match.**

4.9.2 RPM calibration adjustment (1/min, rev/min)

Remark

If on the STC the rpm drive can be read from the interface on the front the gear ratio is i = 1:1. On the other hand if pulses are transmitted by an pulse generator that is fitted to the back of the STC the gear ratio is i = 1:2.

Procedure

- **Set the RPM coding switch to k = 4000 imp/1000 revolutions with switches 3, 4 and 10. (See Section 7, "Setting coding switches").**
- **Insert the tachograph chart(s) and close the unit cover.**
- **Connect the unit to the electricity and drive it on the test bench.**
- **Increase the test bench drive rpm slowly and evenly until the end of the scale is reached and turn it back slowly.**

The rpm indicator should follow evenly and without a noticeable delay.

- **Depending on the unit's nominal value, set speed adjustment 1 on the test bench and adjust the unit display to the adjustment value using a potentiometer (3).**
- **Set adjustment rpm 2 on the test bench and adjust the unit display to the adjustment value using a potentiometer (4)**
  .
- **Repeat the adjustment procedure until the adjustment values match.**

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4.10 Function check

The instructions in the TPH [1],

- Section 3 "Testing instructions"
- Section 5 "Legal requirements"

must be observed. We would like to refer particularly to the following sections or chapters:

Section	Chapter	Topic	Section
3	6	Checking the clockwork mechanism Inserting the tachograph chart at the right time Checking indicator operation.	6.1.1 6.1.3 6.1.4
3	7	Setting time group symbol Warning control unit Distance counter	7.1 7.3 7.4
3	8	Tachograph charts for test chart Test chart/ testing procedure Permissible inherent errors	8.1 8.2 8.3 8.4 8.5
3	5	Auto-diagnosis	5.6
2	7	Testing additional and special equipment	7

If necessary incorrect functions must be corrected.

1 TU00. 1308. 01 000 01

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Section 5 Sealing points

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5 Contents and assignment

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5.4.3	Fitting bezel seal	Fig. 5-5	◦	◦	◦	◦	◦	◦	◦	◦	◦	◦	5-6
5.4.4	Fitting fixing caps for hood fixture	Fig. 5-6	◦	◦	◦	◦	◦	◦	◦	◦	◦	◦	5-7

Key

- **not available**

◦ **optional**

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5.1 Sealing points and protective elements

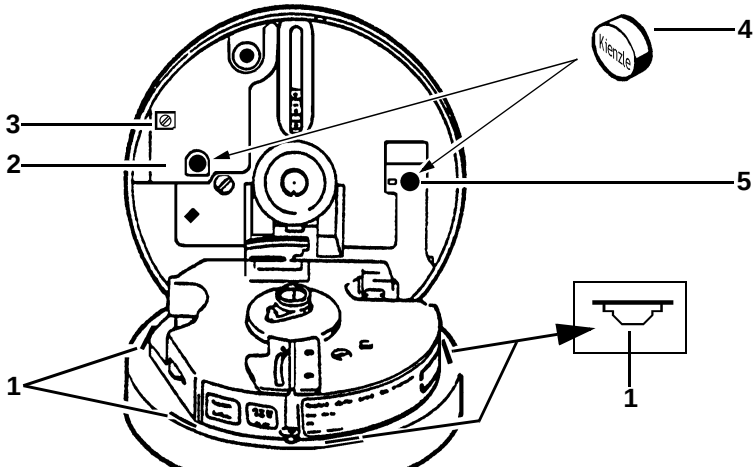

Fig. 5-1 Sealing points and protective elements on the unit

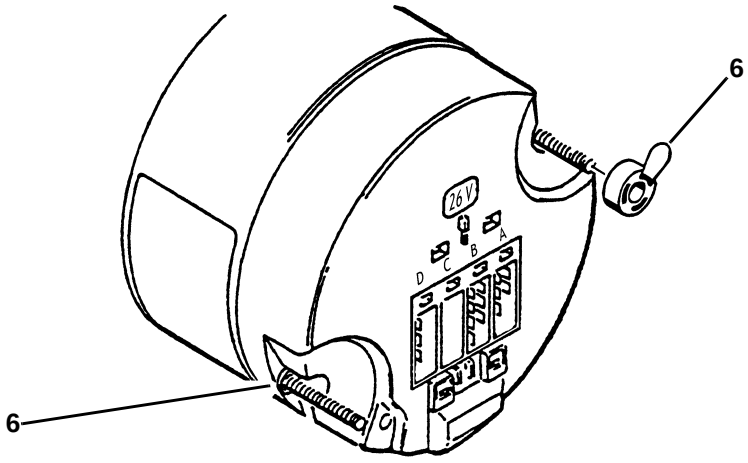

Fig. 5-2 Fixing caps on hood

1 Bezel seal
2 Coding switch cover
3 SIM seal **Lead seal (FR**)
4 Seal cap
5 Cover plate
6 Fixing cap

On NEC/EC Tachographs the parts below are sealed with red seal caps (4):

- Cover plate (5)
- Coding switch cover (2).

The protective elements below are fitted to prevent tampering with the unit.

- Bezel seal (1)
- Hood fixing caps (6)

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5.2 Removing seal caps, bezel seal and fixing caps

Procedure

- **Remove the seal caps (4) on the coding switch cover (2) and cover plate (5). (See Chapter 2.13.1 "Removing cover plate")**
- **Remove the bezel seals (1). (See Chapter 2.3.1 "Removing bezel")**
- **Remove the fixing caps (6) used to fix and protect the hood. (See Chapter 3.2.3 "Removing fixing cap")**

5.3 Fixing cap versions

= Factory fixing cap

= Service fixing cap

From 01.99:
colour changed from red to

Fig. 5-3 Fixing cap versions

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5.4 Fitting seals and fixing caps

5.4.1 Embossing seals

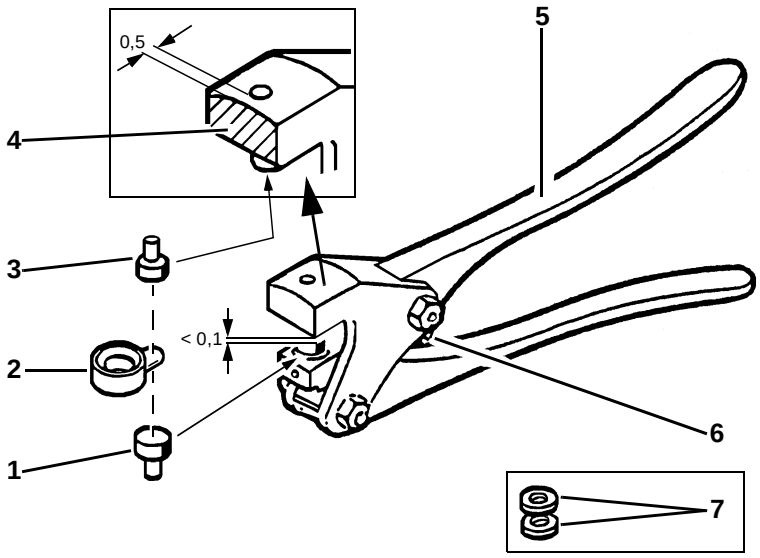

Fig. 5-4 Embossing seals

1 Female die
2 Service fixing caps
3 Male die
4 Front surface
5 Sealing pliers
6 Stop
7 Close tolerance washers

✓ Condition

To emboss service fixing caps (2) the front surface (4) on the traditional sealing pliers (5) must be re-worked.

Procedure

- **File off the front surface (4) to reduce the distance between the front surface (4) and the drilled hole to 0.5 mm.**

✓ Condition

Embossing service fixing caps (2):
The distance between the female die (1) and the male die (3) must be less than 0.1 mm when the stop (6) sits on the sealing pliers lever.
If not, use Z washers (7) to correct this.
(Z 5.2 x B x 0.1 FST, Z 5.2 x B x 0.2 FST or Z 5.2 x B x 0.5 ST)

Procedure

- **Insert the service fixing cap (2) guide between dies (1) and (3).**
- **Close the sealing pliers (5) until the stop (6) sits on the lever.**
- **Open the sealing pliers (5) to remove the service fixing cap (2).**

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5.4.2 Fitting seal caps

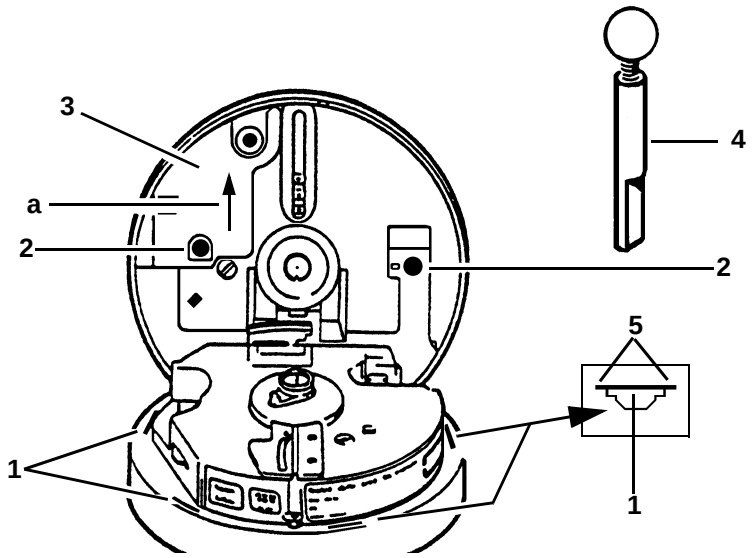

Fig. 5-5 Fitting seal cap and bezel seal

1 Bezel seals
2 Seal cap
3 Coding switch cover (I have also found "calibration switch sealing cover" or "DIL switch cover" in the "Approved tachograph centre manual 2005")
4 Fitting tool
5 Lugs

! Note

Only use the non-transparent, newly designed coding switch cover (3).

Procedure

- **Put the coding switch cover (3) on and lock it into the housing by pushing it in the direction of the arrow (a).**
- **Push the embossed seal cap (2) down to the stop using the fitting tool (4).**

5.4.3 Fitting bezel seal

! Note

The outer lugs (5) must not be damaged.

Procedure

- **Insert new bezel seals (1) into the relevant opening and press them in using a flat tool.**

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5.4.4 Fitting hood fixing caps

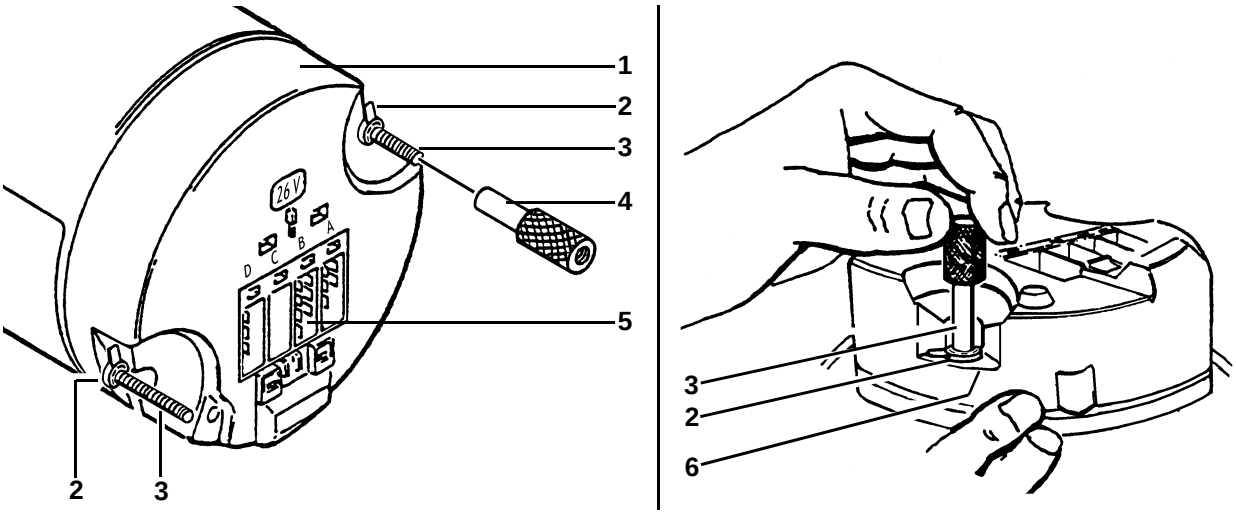

Fig. 5-6 Fitting hood and fixing caps

1 Hood
2 Fixing caps
3 Threaded pins
4 Special tool
5 Trough connector
6 Hood surface

! Note

The top surface of the fixing cap (2) must not be distorted when fitting it.

Procedure

- **Put the hood (1) on correctly (make a note of the threaded pins (3) and trough connector (5))[1] and press it on to the stop.**
- **Fit the embossed fixing caps (2) as shown in Fig. 5-8.**
- **Screw the special tool (4) onto the threaded pins (3) until the fixing cap (2) is flush with the hood surface (6). (See Fig. 5-6)**

1 from 02.94: integrated into the hood

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Section 6 Additional equipment

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Key

- **-** **not available**
- **◦** **optional**
- ***** **discontinued**
- ****** **TU00. 1308.01 000 01**

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6.4.6.2	Wiring diagram	Fig. 6-15	○	○	○	○	○	○	○	-	-	-	6-18
6.4.7	1318 with additional stylus "45", clock generator 2154.02 and pulse memory 2154.01	Fig. 6-16	○	○	○	○	○	○	○	-	-	-	6-20
6.5	Additional equipment "70" - RPM unit without RPM display	Fig. 6-17	-	○	○	-	-	-	-	-	-	-	6-21
6.5.1	Adjustment		-	○	○	-	-	-	-	-	-	-	6-22
6.5.2	RPM constant label		-	○	○	-	-	-	-	-	-	-	6-22
6.6	Additional equipment "B03", "B05" and "B07" * Two speed axle calibration adjustment		-	-	-	○	-	-	-	-	-	-	6-23
6.6.1	Retrofitting	Fig. 6-18	-	-	-	○	-	-	-	-	-	-	6-23
6.6.2	Checking two speed axle calibration adjustment	Fig. 6-19	-	-	-	○	-	-	-	-	-	-	6-24
6.7	Additional equipment "B30" – Automatic power off*	Fig. 6-20	-	-	-	○	-	-	-	-	-	-	6-26
6.7.1	Checking automatic power-off function		-	-	-	○	-	-	-	-	-	-	6-27
6.7.2	Retrofitting automatic power-off board		-	-	-	○	-	-	-	-	-	-	6-27

Key

- **not available**

○ **optional**

***** **discontinued**

****** **TU00. 1308.01 000 01**

! Note

- The procedure for checking the speed pulse output (v pulse) is described in the TPH **, Section 2, Chapter 7, page 21.
- For information on auto-diagnosis equipment please refer to the TPH **, Section 3, Chapter 5, page 7.

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6.1 Additional equipment "01" - Driver change

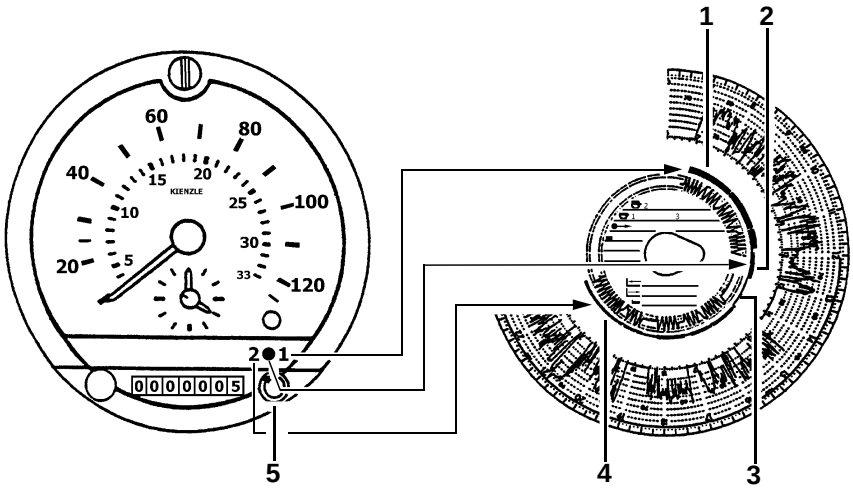

Fig. 6-1 Driver change equipment "01" with tachograph chart recording

1 Bar recording F1
2 Bar recording F3
3 Neutral line
4 Bar recording F2
5 Driver change knob

The "01" driver change equipment enables the driving and stopping times of up to three drivers to be recorded.

Driver change knob assignment
• Position 1 for driver 1
• Position 2 for driver 2
• Position 3 " ● " (neutral) for driver 3

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6.1.1 Recording widths

! Note

The recording width tolerances must be observed when analysing tachograph charts electronically.

Position 1
- **Driver change knob(5) in position "1"**
  - ▶ **Wide bars (1) are recorded. Recording width: 2.15 mm ± 0.2**

Position 2
- **Driver change knob (5) in position "2"**
  - ▶ **Narrow bars (4) are recorded. Recording width: 0.75 mm ± 0.2**

Neutral position
- **Driver change knob (5) in neutral position " ● "**
  - ▶ **Medium wide bar (2) is recorded. Recording width: 1.45 mm ± 0.2**
- **Vehicle is stationary**
  - ▶ **The neutral line (3) is recorded.**

6.1.2 Repair hint

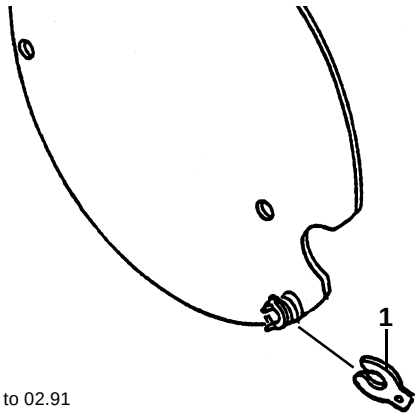

Fig. 6-2 v board service version

1 Insulating disc

Procedure
- **Check and adjust the position of the time stylus. (See Chapter 4.3)**
- **Remove the insulating disc (1) located between the PCB and the contact disc when using a1318.9999.312.xxx v board (service version). (See Chapter3.16.5.1)**

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6.1.3 Checking additional equipment "01"

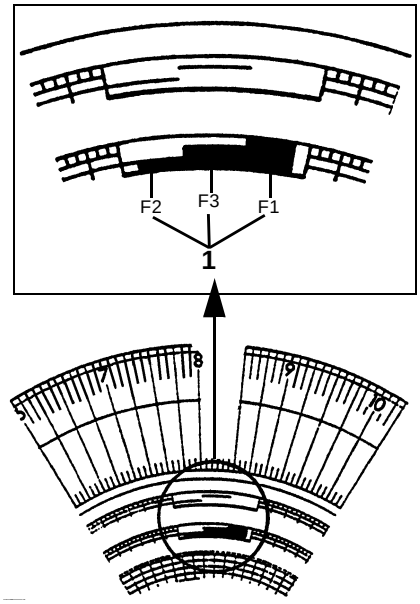

Fig. 6-3 Bar width position – Additional equipment "01"

1 Bar widths

! Note

Use a measuring magnifying glass available from your local dealer to check the various bar width (1) tolerances.

Procedure

- **Insert the adjustment disc [1].**
- **Run the NEC Tachhograph on the test bench.**
- **Set the three "01" additional equipment recording options one after the other.**
- **Check the recordings using the test template.**

Please refer to the TPH, TU00.1308.01 000 01, Section 3, Chapter 8, pages 8 and 9.

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6.2 Additional equipment "04"

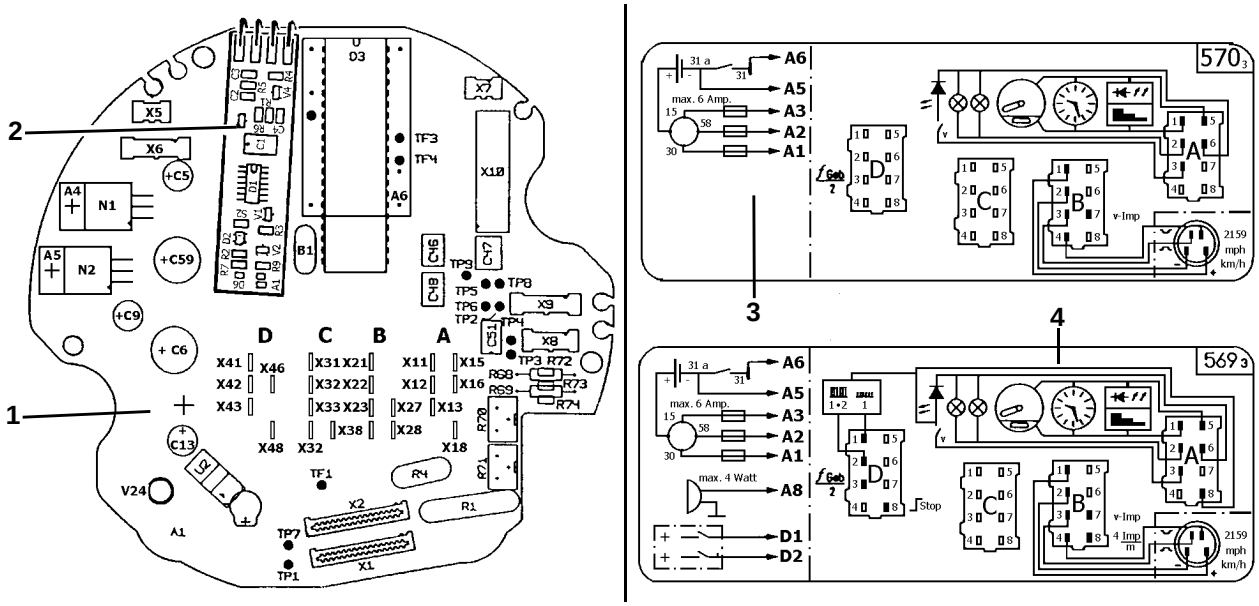

Fig. 6-4 Additional equipment "04"

1 v board

2 Impulse divider – electronic board

3 Circuit diagram "570"

4 Circuit diagram "569"

! Note

- With additional equipment "04" half the generator frequency is applied to connector "D3".
- Additional equipment "49" is a combination of additional equipment units "04" and "48" ("48"= "01" + "09" + "45").

Modification

\+ An electronic pulse divider board (2) is bonded to the v board (1).

For order numbers for the v board (1) with electronic pulse divider board (2) and circuit diagrams (3) and (4) please refer to the Electronic Product Catalogue 1318 (EPC).

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6.3 Additional equipment "09"

Note

- As standard, units with RPM recording function, from manufacturing number 30.000, include additional equipment "09".
- The additional equipment no."09" is not printed on the type plaque.

Additional equipment "09" has the additional outputs below.

- External speed warning contact
- Pulse output 4 imp/m
- Stop signal

6.3.1 External speed warning contact (connector A8)

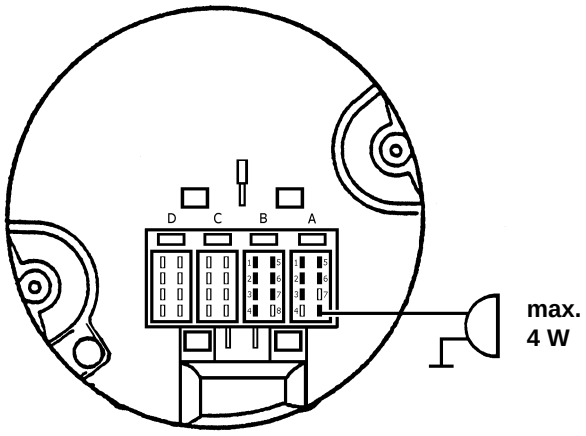

Fig. 6-5 v warning value/ output A8

Note

- The load on the output must not exceed 4 watts. With higher loads a suitable relay must be used for decoupling.
- The speed warning contact performs a warning function.

Function If the preset speed warning value is exceeded, the operating voltage is applied to the output, connector "A8", using the contact carrier (1), Fig. 6-6.

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6.3.2 Adjusting "v" warning value

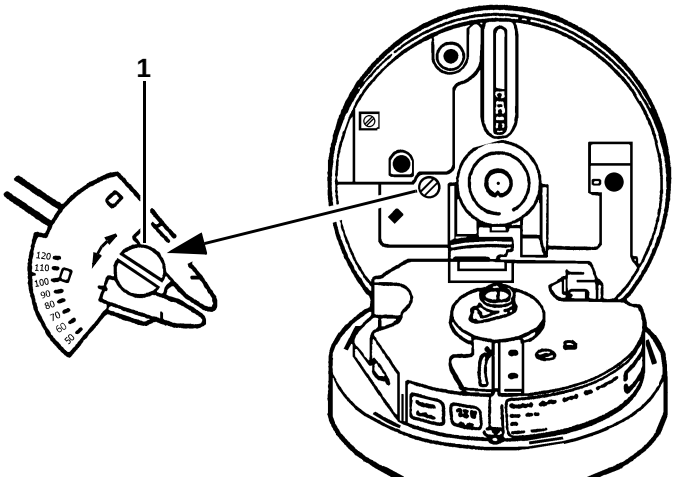

Fig. 6-6 Adjusting "v" warning value

1 Contact carrier

Procedure

- **Connect the unit to the electricity.**
- **Apply the required operating voltage to the output, connector "A8".**

Remark

Make a note of the speed warning value during adjustment.

- Normal: Range 40 ... 100 % of scale end value (e.g. 50...125 km/h).
- With 180 km/h: Range 33 ... 72 % = 60 ... 130 km/h.

- **Set the desired speed warning value using the contact carrier (1).**
- **Run the KTCO on the test bench.**
  - ▶ **The warning LED will light up if the preset speed warning value is reached or exceeded.**
- **Correct the contact carrier setting if necessary.**

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6.3.3 Pulse output 4 imp/m (connector B8)

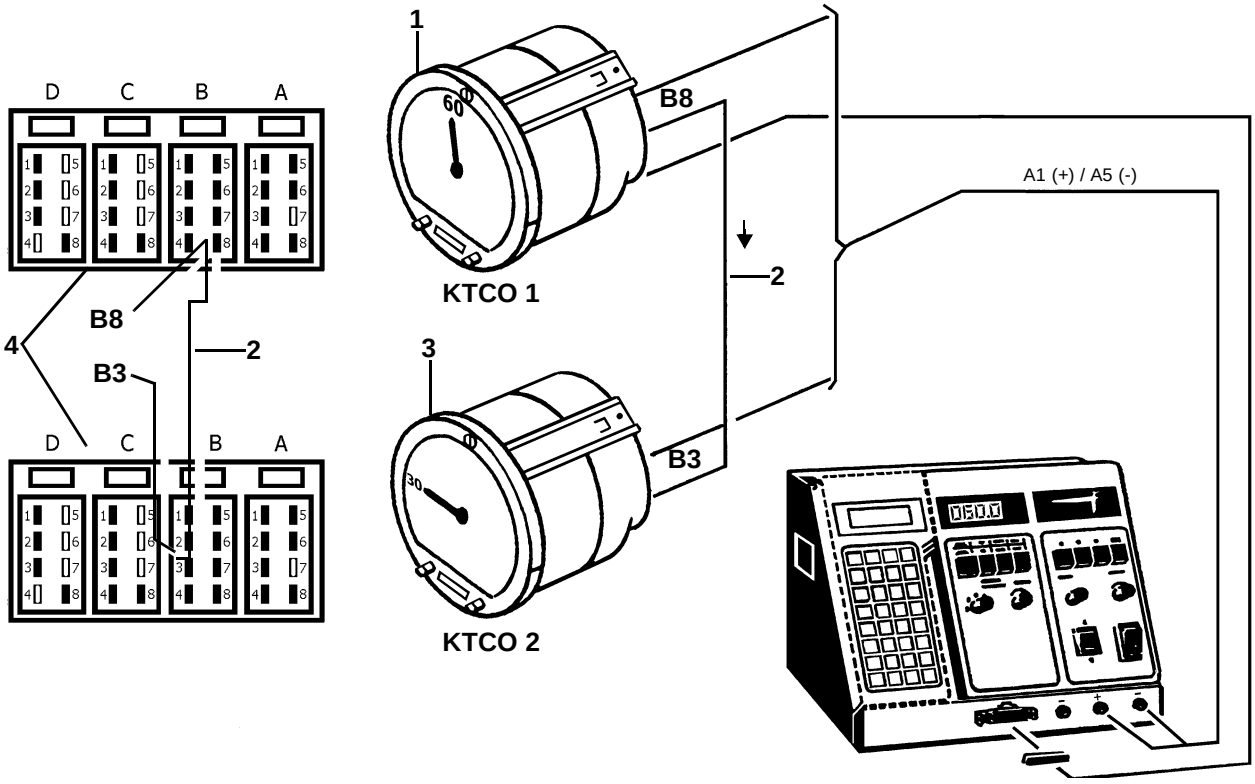

Fig. 6-7 Checking pulse output 4 imp/m

1	KTCO 1	**4**	Trough connector
2	Pulse cable		Connector "B3"
3	KTCO 2		Connector "B8"

! Note

The pulse output is used to control vehicle functions that depend on distance and speed.

Conditions: TPH, TU00.1308.01 000 01, Chapter 6, page 22.

6.3.4 Checking pulse output 4 imp/m

Procedure

- **Connect KTCO (1) and (3) to the electricity.**
- **On units (1) and (3) set the constant k = 8000 imp/km.**
- **Connect the pulse cable (2) to connector "B8" and connector "B3".**
- **Drive the unit (1) to 60 km/h on the test bench.**
  - ▶ **Unit (3) must indicate 30 km/h.**

The display tolerance of unit (3) is ± 1 %.

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6.3.5 Stop signal (connector D8)

! Note

The pulse output is used to control vehicle functions that depend on start-stop conditions.
With µP units a voltage of 7.6 V is applied when driving.

Conditions: TPH, TU00.1308.01 000 01, Chapter 6, page 18.

6.3.6 Checking stop signal

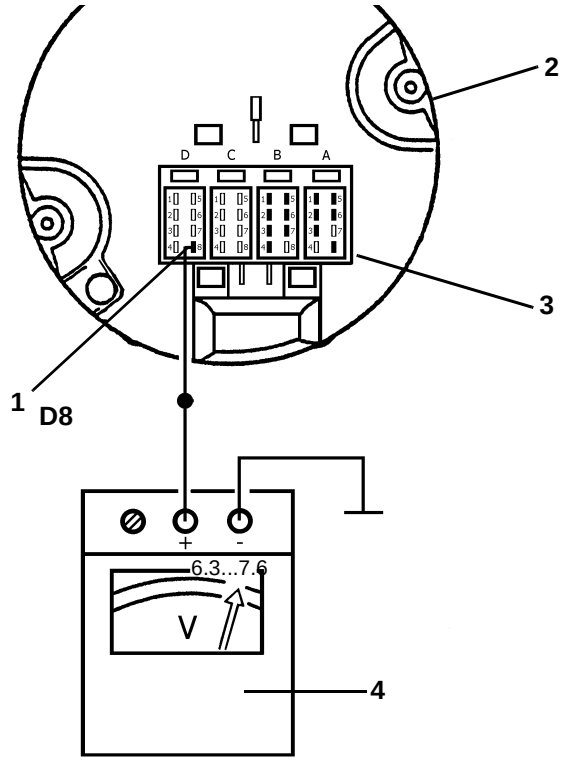

Fig. 6-8 Checking stop signal

1 Connector "D8"
2 KTCO
3 Trough connector
4 Measuring device

Procedure

- **Connect the KTCO (2) to the electricity.**
- **Connect the measuring device's (4) (+) pole to connector "D8" (1) and the (-) pole to the power supply's negative pole.**
- **Run the KTCO (2) on the test bench.**
  - ▶ **The measuring device (4) must display a voltage of U = 6.3 V or 7.6 V.**
- **Turn the speed control device back to 0 km/h.**
  - ▶ **After a delay of about 2 seconds the measuring device (4) must display 0 V.**

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6.4 Additional equipment "45" – Two-level additional stylus (connectors D1 / D2)

Basic application EDM recordings

EDM recordings

- Level 1: Trace length 0.75 mm ± 0.2
- Level 2: Trace length 1.45 mm ± 0.2

For bar recording connect the clock generator "2154.02" between the additional stylus control unit and the NEC Tachograph input.
(See Chapter 6.4.5)

6.4.1 Function

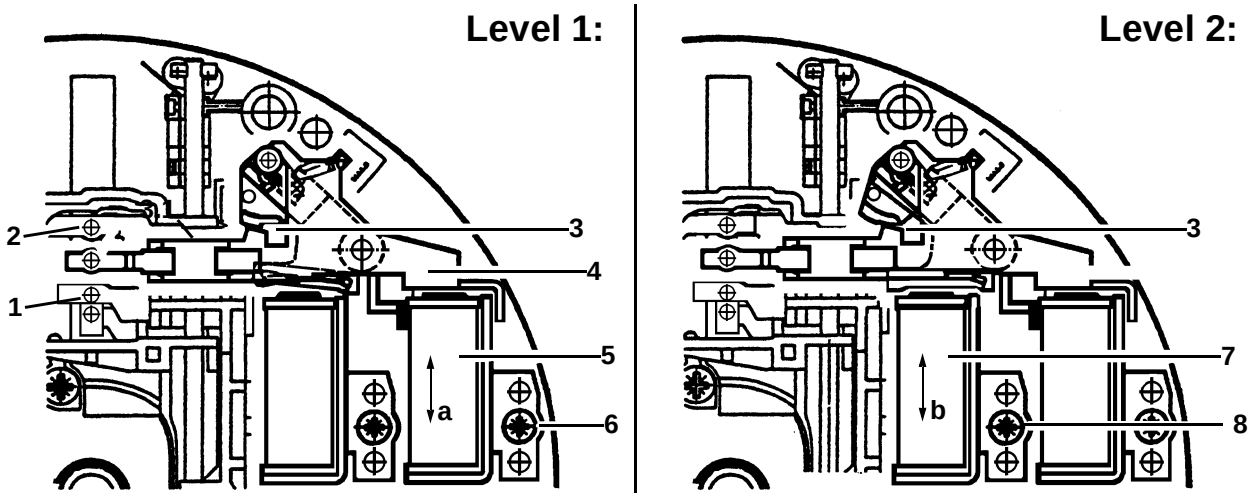

Fig. 6-9 Deflection – Level 1 / Level 2

1	Working time stylus	**5**	Stylus magnet
2	Additional stylus	**6**	Screw
3	Stop	**7**	Stop magnet
4	Stylus lever	**8**	Screw

*Use a pulse memory if the pulse is **< 50 ms**. (See Chapter 6.4.7)*
*If the pulse is **> 50 ms**, the stylus magnet (5) deflects the additional stylus (2) via the stylus lever (4).*

With level 1 the stop (3) limits the bar length.

With level 2 current is supplied to the stop magnet (7) too. As a result, the stop's (3) supporting point is modified.

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6.4.2 Control

Level 1:
- Current supplied to stylus magnet (5) via connector "D1".
- No current supplied to stop magnet (7).

Level 2:
- Current supplied to stylus magnet (5) via connector "D1".
- Current supplied to stop magnet (7) via connector "D2".

6.4.3 Adjusting additional stylus

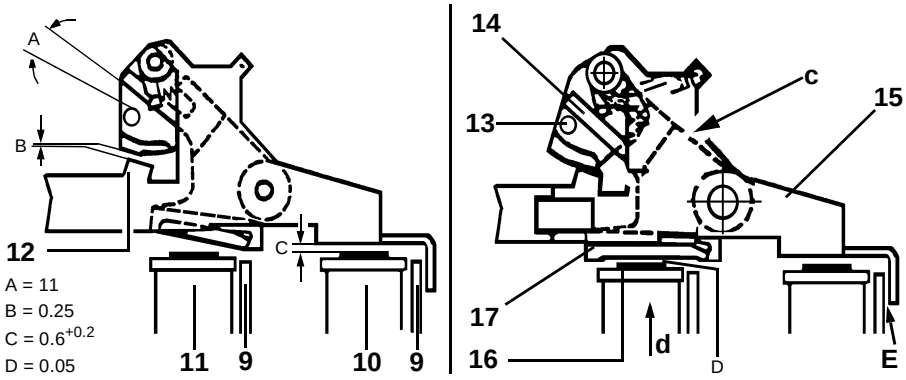

Fig. 6-10 Setting drive parts

9 Yoke
10 Coil
11 Coil
12 Lug
13 Stop
14 Lever
15 Armature
16 Part
17 Part

! Note

- The unit must be switched off when carrying out any adjustment work.
- The stylus lever of the working time stylus (1) and additional stylus (2) must not impede each other. (See Fig. 6-9)
- Magnets (5) and (7) can be set in the direction of the arrows (a) and (b) by undoing screws (6) and (8). (See Fig. 6-9)
- The lever (14) must move freely in area (A).
- If the armature (15) reaches its maximum deflection, there must be an air gap at position (E).

Modified since 02.90

\+ The yoke (9) and coils (10) and (11) have been reduced by 0.7 mm.

Procedure

- **Set dimension B = 0.25 mm on the lugs (12) using a feeler gauge.**
- **Set dimension C = 0.6 mm +0.2 by moving coil (10).**
- **Push the lever (14) down up to the stop (13)in the direction of the arrow (c).**
- **Use the feeler gauge to set dimension D = 0.05 mm and put it between parts (16) and (17).**
- **Push the coil (11) to the stop (13) in the direction of the arrow (d).**
- **Tighten screws (6) and (8). (See Fig. 6-9).**

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6.4.4 Checking recording

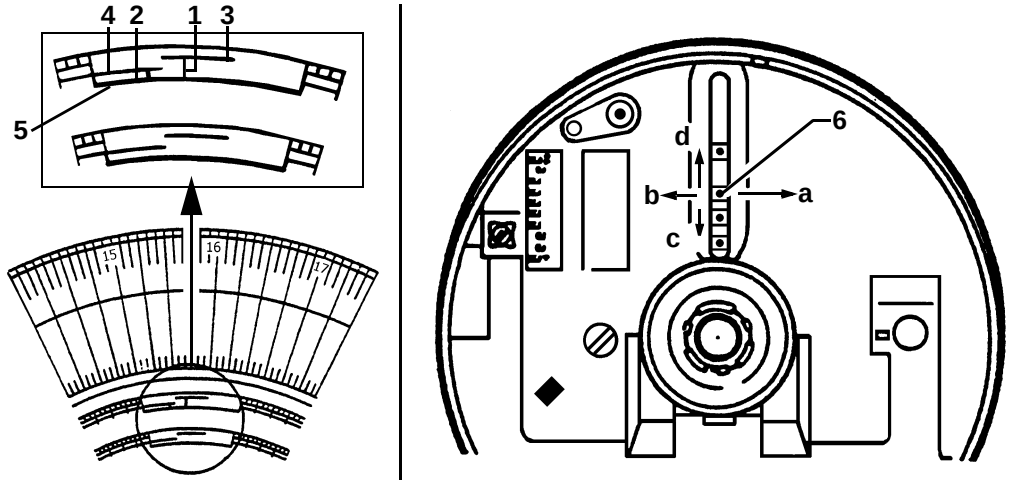

Fig. 6-11 Additional stylus - Checking and adjusting recording

1	Recording	**4**	Circular arc
2	Recording	**5**	Circular arc
3	Circular arc	**6**	Stylus

Procedure

- **Insert [1] the adjustment disc.**
- **Close the housing cover.**
- **Supply voltage to connectors "D1" and "D2" and the negative pole to "A5".**

The recording (1) must be between the circular arcs (3) and (5).

Adjusting

- **Using the adjustment tool correct the position of the stylus (6) in the direction of arrow (a) or (c) or (b) or (d) (see Chapter4.1*)*.**

The stylus (6) must be aligned with the other styluses.

- **Supply voltage to "D1" only.**
- **Check the recording (2) made.**

The recording (2) must be between the circular arcs (9) and (10).

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6.4.5 Retrofitting additional stylus

! Note

Except for the CH version, all unit versions can be retrofitted with a two-level stylus.

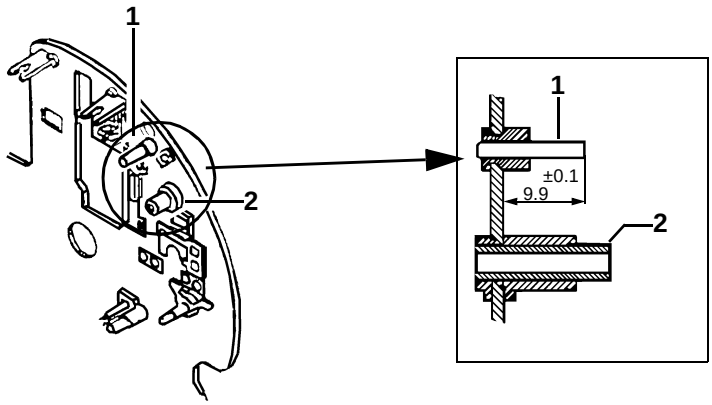

Fig. 6-12 Retrofitting additional stylus: Fitting straight pin and bearing

1 Straight pin **2** Bearing

When fitting the two-level additional stylus:

– **Fit the straight pin (1) and bearing (2) if necessary.**

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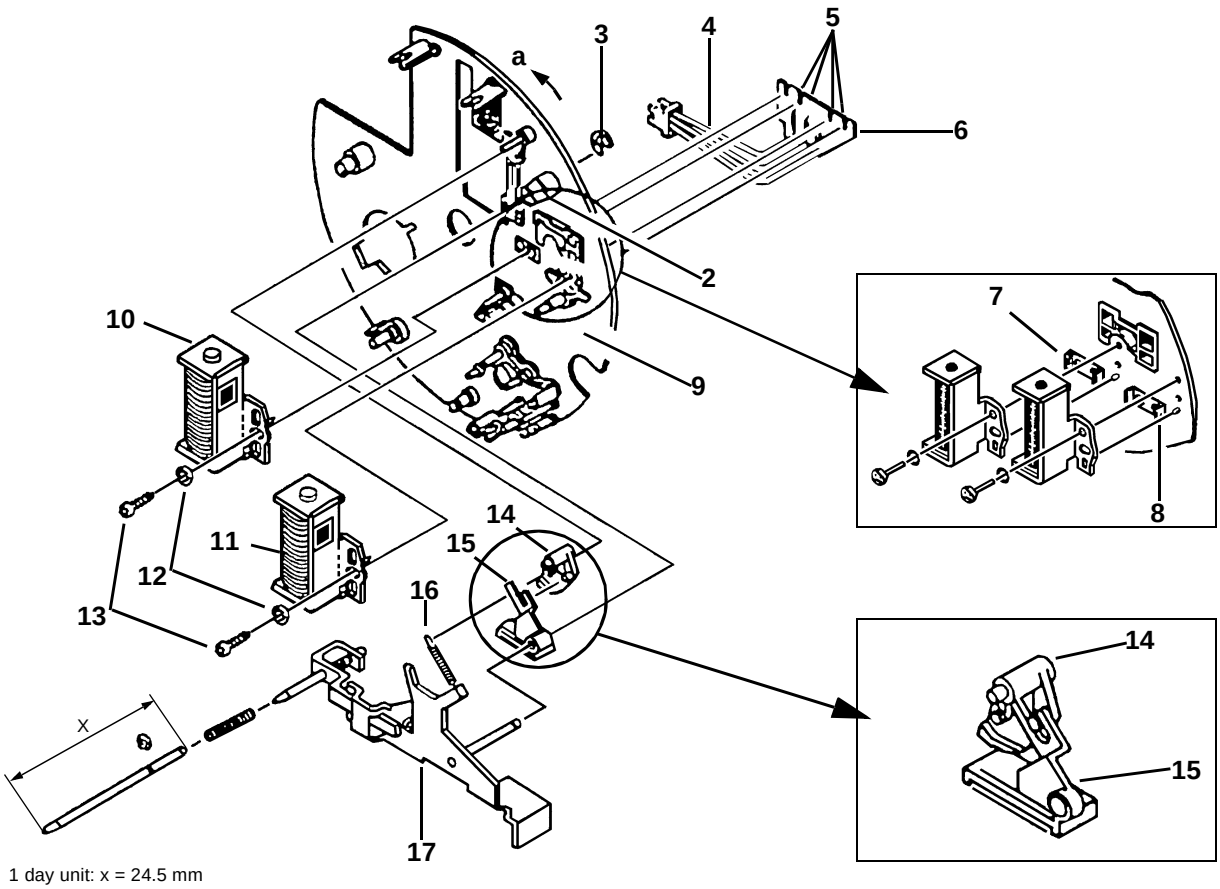

Fig. 6-13 Fitting two-level additional stylus to frame plate

3 Retaining washer
4 Wires
5 Grooves
6 Diode plate
7 Frame fixing base
8 Frame fixing
9 Frame plate
10 Magnet
11 Magnet
12 Flat washers
13 Filister head screws
14 Stop
15 Lever
16 Tension spring
17 Stylus holder

! Note

With units before manufacturing no. 28.500:

- Enlarge the fixing holes for magnets (10) and (11) to ø 2.2 mm so that the filister head screws (13) can be used.

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Procedure

- **Push the connection pins of magnets (10) and (11) through the frame fixings (7) and (8).**
- **Fix the magnets (10) and (11) using the filister head screws (13).**

Note

The connection pins of magnets (10) and (11) must be in the grooves (5).

- **Fit the diode plate (6).**
- **Run the wires (4) in the direction of the arrow (a).**
- **Fix the wires (4) to the frame brackets.**
  (See Chapter 3.14.2)
- **Solder the connection pins to the diode plate (6).**
- **Join the stop (14) and the lever (15) together.**
- **Put the stop (14) and the lever (15) onto the frame plate (9).**
- **Insert the stylus holder (17) into the bearing (2).**
- **Fix the stylus holder (17) with the retaining washer (3).**
- **Hook the tension spring (16) in.**
- **Adjust.**
  (See Chapter 6.4.2)

6.4.6 Clock generator 2154.02

6.4.6.1 Dimensions

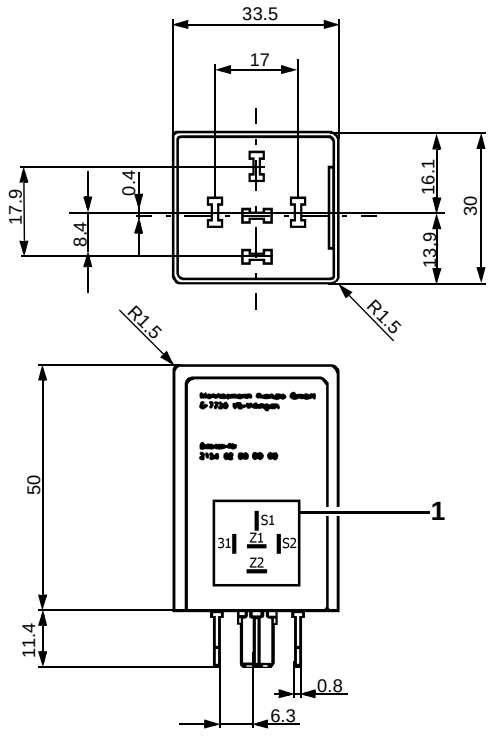

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Fig. 6-14 Dimensions - Clock generator 2154.02

1 Connection diagram

Technical data	
• Dimensions:	WxHxD: 33.5 mm x 66.4 mm x 30 mm
• Connection diagram (1):	affixed to each clock generator
• Operating voltage:	10.5 to 30 V
• Power consumption:	approx. 5 mA at 12 V approx. 25 mA at 24 V
• Clock pulse timing:	approx. 3 seconds
• Operating temperature:	- 25 to + 70 °C
• Wiring diagram:	see Fig. 6-15
• Recording events:	> 0.6 seconds

6.4.6.2 Wiring diagram

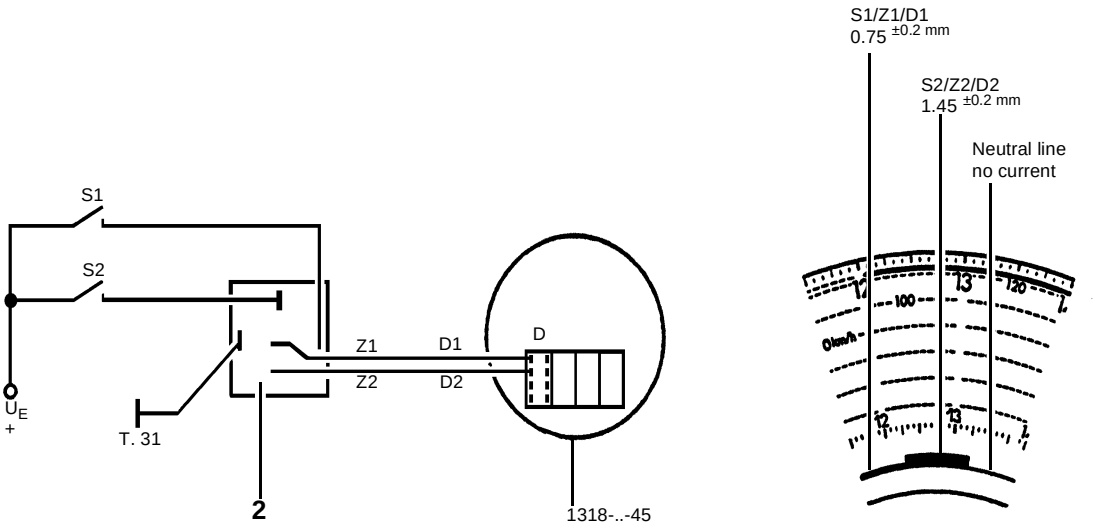

Fig. 6-15 Wiring diagram - Clock generator 2154.02

2 Clock generator

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Note

Fitting:
First connect the KTCO to the clock generator. Use a standard receptacle for this.

Note

If level 2 is switched on too for a short time, level 1 must be clocked so that the stylus goes back to level 1 again.

Possible functions of clock generator 2154.02

- Bar recording
- The two different bar widths (0.75 mm and 1.45 mm) can be controlled independently.
- Recording short events > 200 ms.
  (> 6 seconds for additional stylus "03")

In these cases, the pulse memory 2154.01 must be installed too.

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6.4.7 1318 with additional equipment "45" - Clock generator and pulse memory

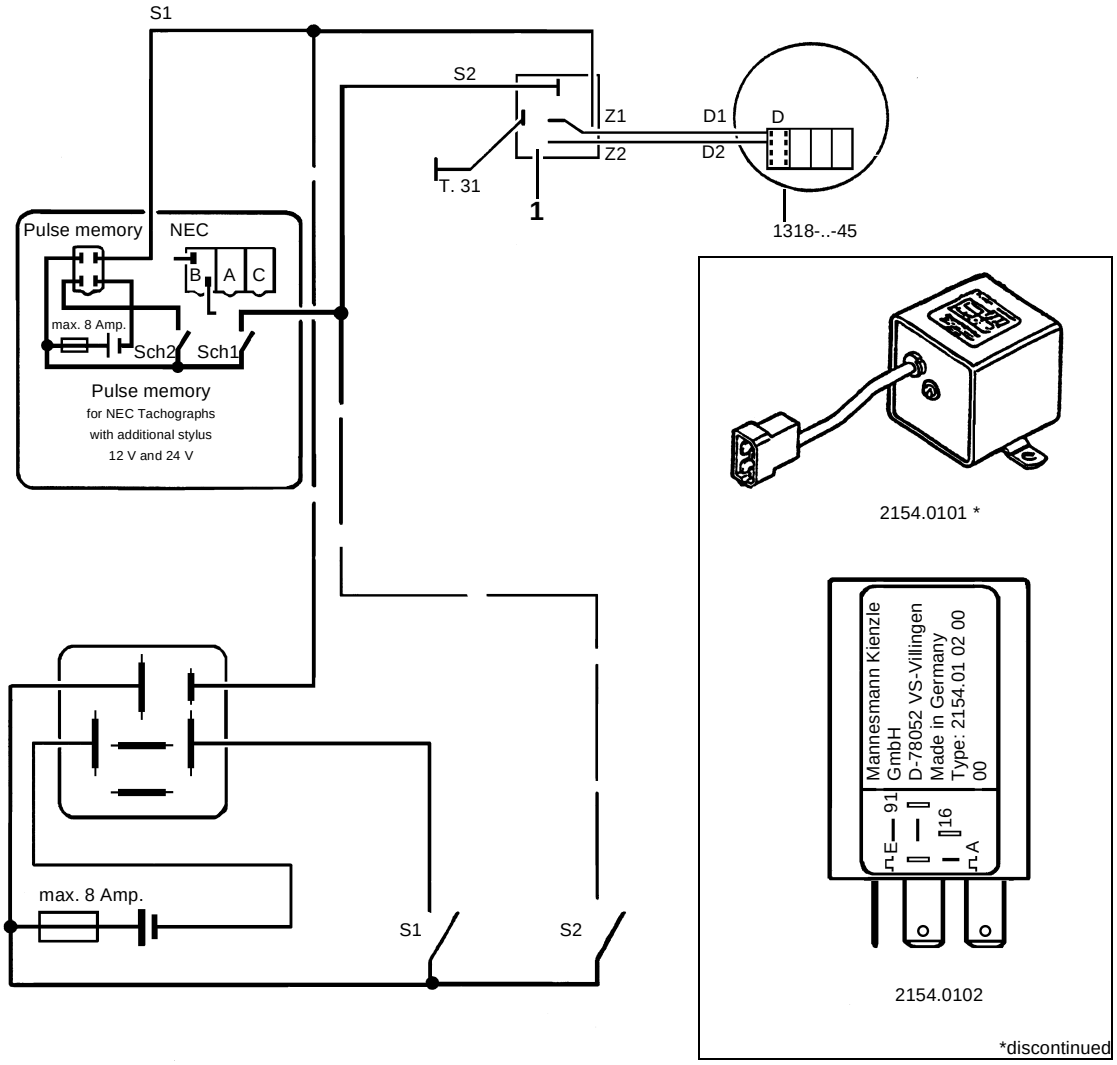

Fig. 6-16 Wiring diagram

1 Clock generator

Procedure – **Install the pulse memory 2154.01 or 2154.0102 to record events from about 200 ms to about 6 seconds. (See Fig. 6-16)**

The recordings are as shown in Fig. 6-15. However, with the "S2" setting only single traces can be drawn. For example: "S1" = blue flashing light and "S2" = short siren.

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6.5 Additional equipment "70" – RPM unit without RPM display

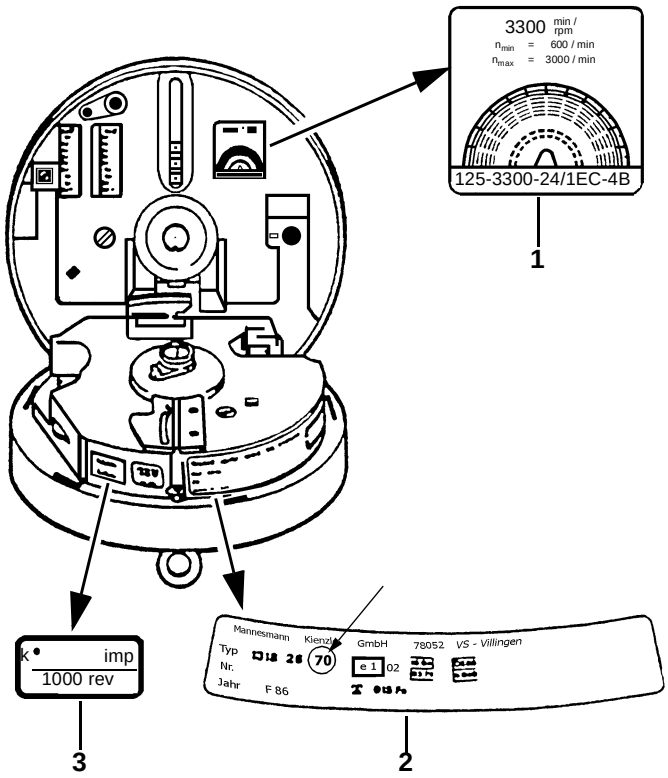

Fig. 6-17 RPM unit without display

1 Measuring range/tachograph chart label

2 Type plaque

3 Adhesive label

Remark

- This unit version records the number of revolutions without showing this on the dial.
- The measuring range and the correct tachograph chart are indicated on the label (1).

Distinguishing characteristics

– Figure "70" on the type plaque (2)

– RPM connection on the circuit diagram label on the housing

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6.5.1 Adjusting

Procedure

- **Insert [1] the adjustment disc.**
- **Check the zero line setting and adjust it if necessary. (See Chapter 4.7)**

Setting adjustment RPM 1

- **Set the RPM coding switch to k = 4000 imp/1000 rev.**
- **Insert the correct original tachograph chart into the unit.**
- **Close the cover.**
- **Switch on the power.**
- **Set the unit to the adjustment RPM 1= 500/min on the test bench.**

! Note

Correct the setting using the potentiometer (3).
(See Chapter 4.9)

The recording on the tachograph chart must end exactly on the grid circle (1000/min).

Setting adjustment RPM 2

Perform the steps described for "Setting adjustment RPM 1".

! Note

- Correct the setting using the potentiometer (4). (See Chapter 4.9)
- For setting value please refer to Chapter 4.9.

Repeat the adjustment procedure until the adjustment values match the grid circles on the tachograph chart. When doing this, the transmission ratio must be i = 1 : 2.

6.5.2 RPM constant label

Remark

If the RPM value differs from the value 4000 imp/1000 rev (factory and adjustment setting), the modified RPM constant must be written on the adhesive label, Fig. 6-15. Affix the label as indicated.

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*6.6 Additional equipment "B03", "B05" and "B07" *(connector D5)*

Remark

If rear axle transmission is activated, the vehicle's modified characteristic coefficient imp/km must be adjusted to the actual imp/km by carrying out a **two speed axle calibration adjustment**. When doing this, please remember that, depending on the vehicle type, switchover is controlled either by the positive or negative potential. The additional equipment is no longer available with µP units!

6.6.1 Retrofitting

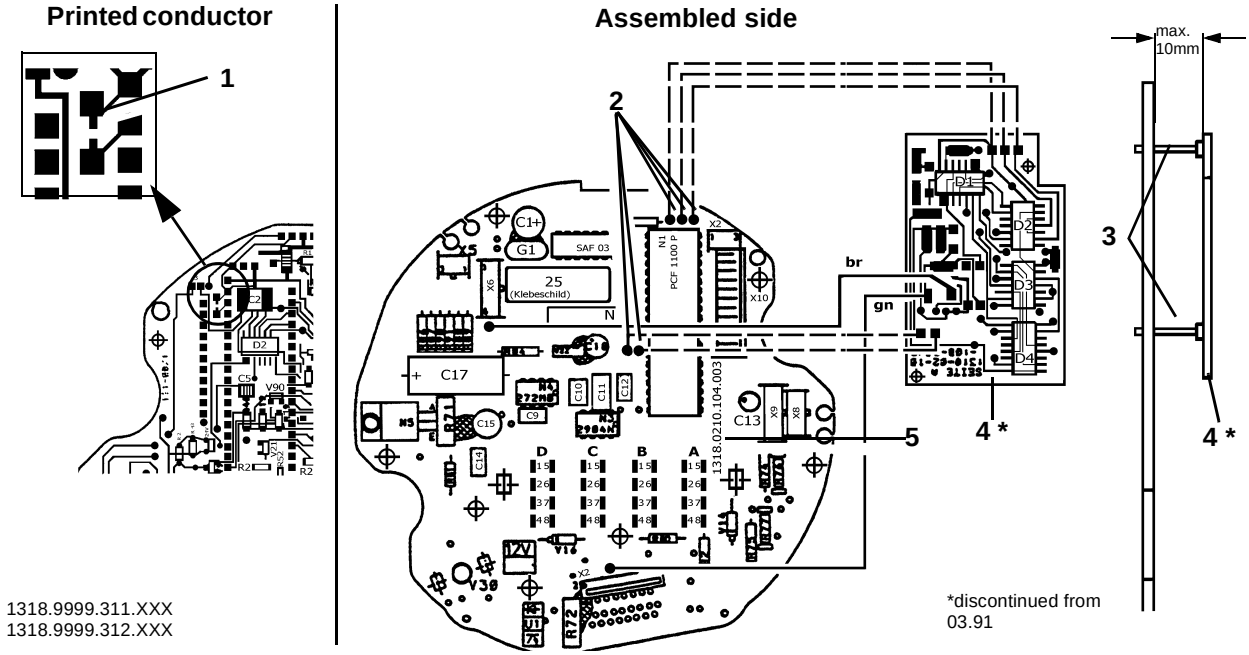

Fig. 6-18 v board: Cutting conductors, inserting HA board and soldering it on

1 Conductor
2 Soldering points
3 Strips
4 HA board
5 v board number

Remark

- Retrofitting is only possible with a v board with connector D5. This concerns v boards with board numbers (5):
  - 1318.0210.104.003 / ....111.0XX / ....114.001 / 112.0XX
- Do not cut the printed conductor if there is no two speed axle adjustment.
- The maximum distance between the v board and the HA board is 10 mm.

Procedure

- **Cut the printed conductor (1) and remove the SMD component.**
- **Remove the soldering points (2) by suction.**
- **Put the HA board 4 on the v board with the strips facing down and solder it on.**
- **Solder the green and brown wires on the HA board.**

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6.6.2 Checking two speed axle adjustment

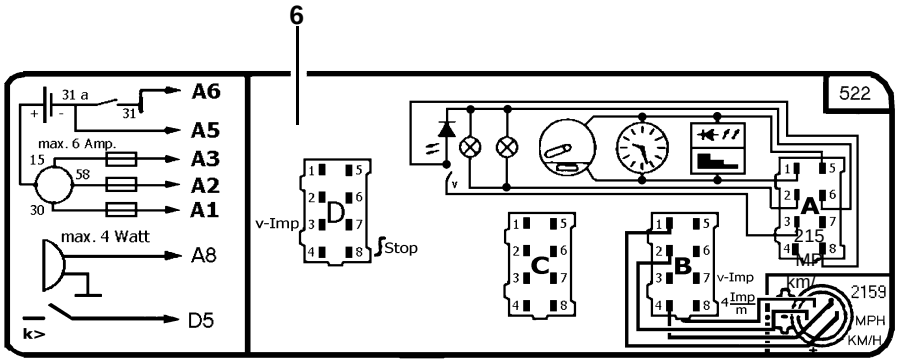

Fig. 6-19 HA circuit diagram label

6 Label

Remark

- When the HA board is fitted, attach the two speed axle adjustment label (6) to the housing.
- Calculate the speed with the rear axle transmission switched off.

Example

i = 1.368 : 1

v_1 = 60 km/h (test bench reading)

v_2 = v_1 : i = 43.9 km/h

Procedure

- **Set the tachograph constant k = 8000 imp/km.**
- **Connect the unit to the electricity with connection wire "A" and connect wire "B" to supply pulses to it.**
- **Set the KTCO test bench to 60 km/h.**
- **Supply a 0 V potential with negative switching action.**

or

- **With positive switching action supply a plus potential to connector D5.**
  - ▶ **In the above example, the tachograph speed must drop from 60 km/h to 43.9 km/h.**

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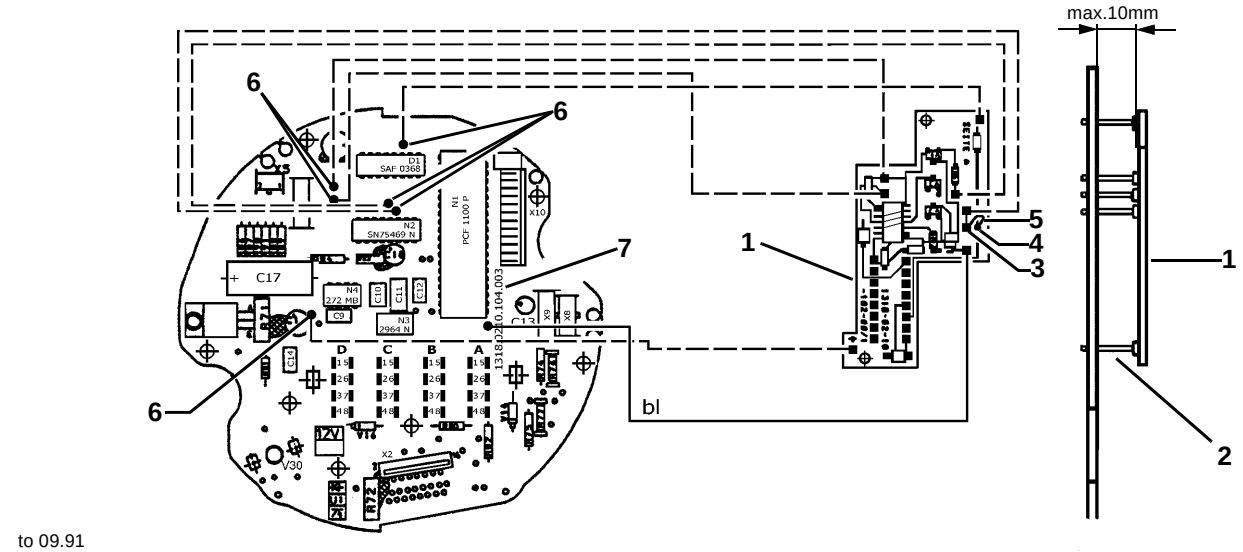
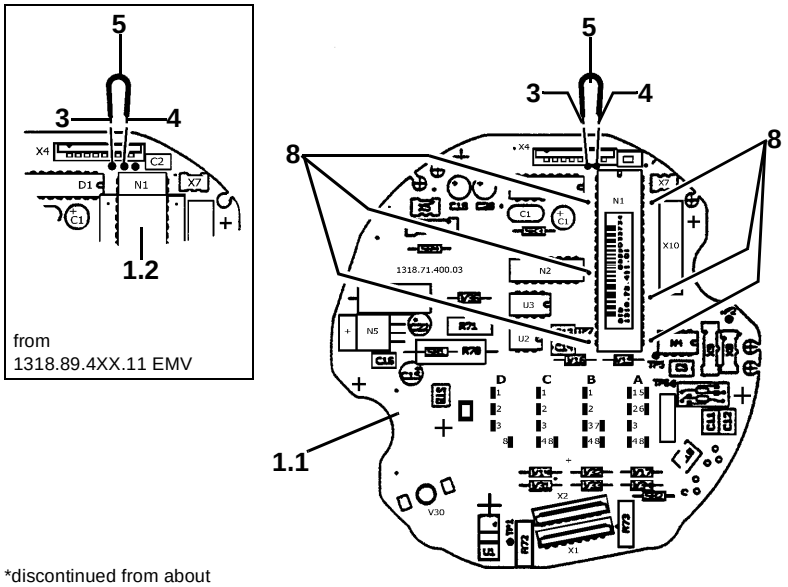
6.7 Additional equipment "B30" – Automatic power off



to 09.91
1318.9999.311.XXX
1318.89.1XX.02



from 10.91 to 02.93
1318.89.4XX.01 EMV
1318.89.4XX.04 EMV

*discontinued from about

Fig. 6-20 Automatic power-off function

1 Board
1.1 v board
1.2 v board
2 Strips
3 Soldering point
4 Soldering point
5 Insulated wire
6 Soldering points
7 v board number
8 Soldering points

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Remark

- Additional equipment "B30" guarantees that the WT system is switched off automatically if the vehicle has been stationary for 36 hours. Thus, power will be only supplied to the clock mechanism, regardless of the knob settings.
- With µP units (EC version) the automatic power-off function is standard and is activated after 25 hours. The relevant electronic components are located on the EC v board. These cannot be checked.

6.7.1 Checking automatic power-off function

Note

- The anti-static protective measures must be observed.
- The board is a CMOS board.

Procedure

– **Turn the two knobs to position " ⍁ ".**

– **On the board (1) or v board (1.1) or (1.2) bridge soldering points (3) and (4).**

Use an insulated wire (5) for this; maximum 20 cm long with a cross-section of A = 0.75 mm².

▶ **When the two points are bridged, the distance/working time motor must switch off after seven to ten seconds.**

6.7.2 Retrofitting automatic power-off board

Remark

v boards 1318.0210.104.001 and 1318.0210.104.001 cannot be retrofitted.

Procedure

– **On the v board remove any solder on soldering points (7) by suction.**

– **Put board (1) on the v board with the strips (2) facing down and solder it on.**

– **Solder the blue wire to the v board [1]. (See illustration)**

– **Perform the check. (See Chapter 6.7.1)**

1 to 09.91

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Section 7 Wiring diagrams, fault analysis

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7 Contents and unit assignment

Contents/Unit assignment		Fig.	EC Tacho-graphs				NEC Tacho-graphs			NEC Tacho-graphs CH			Page
			-24	-25	-26	-27	-02	-04	-06	-01	-03	-05	
7	**Wiring diagrams and fault analysis**												
7.1	Connector assignment Connectors "A, B, C, D"	Abb. 7-1	o	o	o	o	o	o	o	o	o	o	7-3
7.2	Colour codes		o	o	o	o	o	o	o	o	o	o	7-3
7.3	Additional equipment "A" and "B" – Type summary / combinations		o	o	o	o	o	o	o	o	o	o	7-4
7.4	Fault analysis workflow sample	Abb. 7-2	o	o	o	o	o	o	o	o	o	o	7-5
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7.7	"Basic" wiring diagram and fault analysis microprocessor v board (µP)	Abb. 7-5	o	o	o	o	o	o	o	o	o	o	7-10
7.8	"RPM" wiring diagram and fault analysis microprocessor v board (µP)	Abb. 7-6	-	-	o	o	-	-	o	-	-	o	7-12
7.9	"EC units" and "CH" wiring diagram and fault analysis	Abb. 7-7	o	o	o	o	-	-	-	o	o	o	7-14
7.10	Additional equipment "A" and "B" wiring diagram and fault analysis	Abb. 7-8	o	o	o	o	o	o	o	o	o	o	7-16

Key

- \- **not available**
- o **optional**

! Note

- Section 7 includes KTCO 1318 and additional equipment wiring diagrams.
- For information on voltage and current ratings, inputs and outputs, please refer to the ITPH TU00.1308.01 000 01, Section 2, Chapter 6, pages 6-14 to 6-18.

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7.1 Connector assignment and connections "A, B, C, D"

Note

Service version
- 16 tab connectors for v units
- 21 tab connectors for v + n units

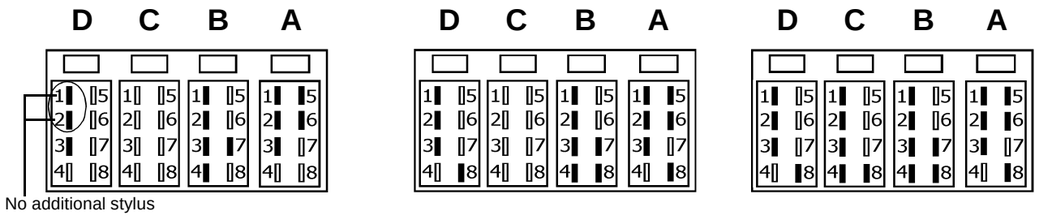
D C B A
No additional stylus
v unit (11) tab connectors µP version
v unit (13) tab connectors *
v unit (15) tab connectors *
D C B A
v unit + ZuE (16) tab connectors
v unit + ZuE (18) tab connectors *
v unit + ZuE (19) tab connectors *
D C B A
v unit + ZuE + n (21) tab connectors
v unit + ZuE + n (22) tab connectors
v unit + ZuE + n (24) tab connectors *
v unit + ZuE + n (27) tab connectors *
v unit + ZuE + n (30) tab connectors *

Fig. 7-1 Trough connector versions

***** discontinued

Connector "A", power supply			**Connector "B", speed v (yellow)**			
E	A1	T. 30 + clock v mesuring system	A	B1	+	
E	A2	T. 58 + illumination	A	B2	-	
E	A3	T. 15 + warning contacts and n measuring system (w/o STB)	E	B3		to sender units 2159 01 and 2159-... 50
E	A4	T. 30 + cable for n measuring system and STB -65 (to approx 10.94; then µP)	E	B4		
E	A5	T. 31a – clock v mesuring system		*B5	Control input (-)	Not permitted in the EU and Switzerland
E	A6	T. 31 – illumination, additional stylus		*B6	negative (to 07.92)	
-	A7	not used	A	B7	v imp	
A	A8	v warning contact (external) max. 4 watts	A	B8	4 imp/m	
Connector "C", RPM n (red)			**Connector "D", additional functions (brown)**			
A	C1	+	E	D1	+ additional stylus - 45 / - 46	not with v units
A	C2	-	E	D2	+ additional stylus - 45 / - 46	
E	C4		A	D3	v imp	
E	C3	Terminal W		*D4	n imp up to approx. 06.90	to approx. 09.91
	C5	not used		*D5	Two speed rear axle	
	*C6	4 imp/rev		*D6	Info input (with n units)	
	*C7	n pulse		*D7	Info input (with n units)	
A	C8	n warning contact max. 4 W	A	D8	Stop signal (6.3...7.6 V when driving; after 2 seconds stop ->0 V)	

to approx. 06.90

Signal input for inductive sender unit 2159-50

A = output E = input

7.2 Colour codes

German		**English**		**French**		**Spanish**	
weiß	= ws	white	= wt	blanc	= bc	blanco	= bc
braun	= br	brown	= br	marron	= ma	marrón	= ma
grün	= gn	green	= gn	vert	= vt	verde	= vd
gelb	= ge	yellow	= ye	jaune	= ja	amarillo	= am
grau	= gr	grey	= gr	gris	= gr	gris	= gr
blau	= bl	blue	= bl	bleu	= bu	azul	= az
schwarz	= sw	black	= bk	noir	= nr	negro	= nr
weiß-gelb	= wsge	white-yellow	= wtye	blanc-jaune	= bcja	blanco-amarillo	= bcam
weiß-blau	= wsbl	white-blue	= wtbl	blanc-bleu	= bcbu	blanco-azul	= bcaz
weiß-rot	= wsrt	white-red	= wtr	blanc-rouge	= bcrg	blanco-rojo	= bcro
braun-schwarz	= brsw	brown-black	= brbk	marron-noir	= manr	marrón-negro	= manr
grün-schwarz	= gnsw	green-black	= gnbk	vert-noir	= vtnr	verde-negro	= vdnr
gelb-rot	= gert	yellow-red	= yer	jaune-rouge	= jarg	amarillo-rojo	= amro
grau-rot	= grrt	grey-red	= grr	gris-rouge	= grrg	gris-rojo	= grro
weiß-grün	= wsgn	white-green	= wtgn	blanc-vert	= bcvt	blanco-verde	= bcvd
gelb-braun	= gebr	yellow-brown	= yebr	jaune-marron	= jama	amarillo-marrón	= amma
rosa	= rs	pink	= p	rosé	= re	rosa	= rs

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7.3 Additional equipment "A" and "B" – Type summary / combinations

! Note

With 180 km/h units an additional stylus cannot be fitted as the zero line is recorded too far down.

Additional equipment		Device version									
ZuE "A"		**01**	**02**	**03**	**04**	**05**	**06**	**24**	**25**	**26**	**27**
*01	Driver change	–	X	–	X	–	X	–	–	–	–
*09	External warning contact + pulse output 4 imp/m + stop signal	X	X	⊕	⊕	X	X	X	⊕	⊕	X
*45	2 level additional stylus	–	X	–	X	–	X	X	X	X	X
*55	STB (barrier unit) connection	–	–	–	–	X	–	X	–	–	X
*65	Connector for STB with separate positive wire	–	–	X	–	–	–	–	X	X	–
*70	No RPM display	–	–	X	–	–	–	–	X	X	–
*80	STB 3 connection	–	–	–	–	–	–	X	X	X	X
ZuE "B"											
01	Device for driver cluster (buses) incl. bracket and fasteners										
02** to 05**	Two speed axle adjustment "negative"	–	–	–	–	–	–	–	–	–	–
06** to 09**	Two speed axle adjustment "positive"	–	–	–	–	–	–	–	–	–	–
30	Automatic power off after 36 hours	–	–	–	–	X	–	X	–	–	
41 to 50	PRM constant differs from $k = \frac{4000\text{imp}}{1000\text{rev}}$	–	–	X	X	–	–	–	X	X	–

41 ≙ K = 16800 43 ≙ K = 21000 45 ≙ K = 30000

42 ≙ K = 18000 44 ≙ K = 22920 46 ≙ K = 20720

47 ≙ K = 26280 49 ≙ K = 19200 50 ≙ K = 24000

X ≙ ZuE possible * ≙ currentlyavailable for delivery ** ≙ discontinued

– ≙ not available for delivery ⊕ ≙ Standard from manufacturing no. 30000

Please also refer to the TPH, TU00.1308.01 000 01, Section 1, Chapter 1, page 8.

Combinations		Device version										Remarks
ZuE "A"	**including**	**01**	**02**	**03**	**04**	**05**	**06**	**24**	**25**	**26**	**27**	
*15	01 + 09	–	X	–	–	–	X	–	–	–	–	
*46	09 + 45	–	X	–	–	–	X	X	–	–	X	
*47	01 + 45	–	X	–	–	–	–	–	–	–	–	
*48	01 + 09 + 45											
*49	04² + 48											² = half sender unit frequency; no longer standard with VW
*56	45 + 55	–	–	–	–	–	–	–	–	–	X	
*57	09 + 55	–	–	–	–	–	–	X	–	–	–	
*58	46 + 55	–	–	–	–	–	–	–	–	–	X	
*66	45 + 65	–	–	–	–	–	–	–	X	X	–	
*72	45 + 70	–	–	–	–	–	–	–	X	X	–	
*73	65 + 70	–	–	–	–	–	–	–	X	X	–	
*74	66 + 70	–	–	–	–	–	–	–	–	–	–	
*81	09 + 80	–	–	–	–	–	–	X	X	X	X	
*82	46 + 80	–	–	–	–	–	–	X	X	X	X	
*84	45 + 80	–	–	–	–	–	–	X	X	X	X	
*85	70 + 80	–	–	–	–	–	–	–	X	X	–	
*86	70 + 84	–	–	–	–	–	–	–	X	X	–	
ZuE "B"	**including**											
33 **	03 + 30	–	–	–	–	–	–	–	–	–	–	

Two speed axle adjustment gear ratio i		
ZuE "B"	**i**	**Switch type**
02 **	1.238 : 1	(-)
03 **	1.368 : 1	(-)
04 **	1.391 : 1	(-)
05**	1.404 : 1	(-)
06 **	1.238 : 1	(+)
07 **	1.368 : 1	(+)
08 **	1.391 : 1	(+)
09 **	1.404 : 1	(+)

Combinations with ZuE "B"			
ZuE "B"	**including**		
12 **	ZuE "A" 09	and	"B" 02
13 **	ZuE "A" 09	and	"B" 03
14 **	ZuE "A" 09	and	"B" 04
15 **	ZuE "A" 09	and	"B" 05
16 **	ZuE "A" 09	and	"B" 06
17 **	ZuE "A" 09	and	"B" 07
18 **	ZuE "A" 09	and	"B" 08
19 **	ZuE "A" 09	and	"B" 09

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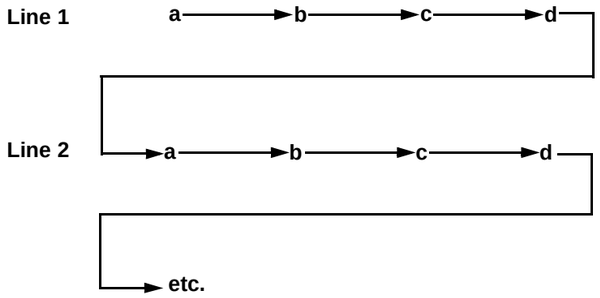
7.4 Fault analysis workflow sample

Remark

- **Observe the anti-static protective measures.** (See Chapter 1, page 7-4)
- Before starting any measurement, ensure that the unit's operating voltage is correct.
- When measuring resistance, disconnect from power and remove connectors "A" ... "D".
  .
- Use the test adapter (4), 1601.9900.010.000, when carrying out input or output measurements on the minitimer connectors.
- All measurements are based on
  - – $k = \frac{8000\text{imp}}{\text{km}}$: Speed coding switch (1) (switches 2, 3 and 9 set)
    .
  - – $k = \frac{4000\text{imp}}{1000\text{rev}}$: RPM coding switch (2) (switches 3, 4 and 10 set)

Example of workflow



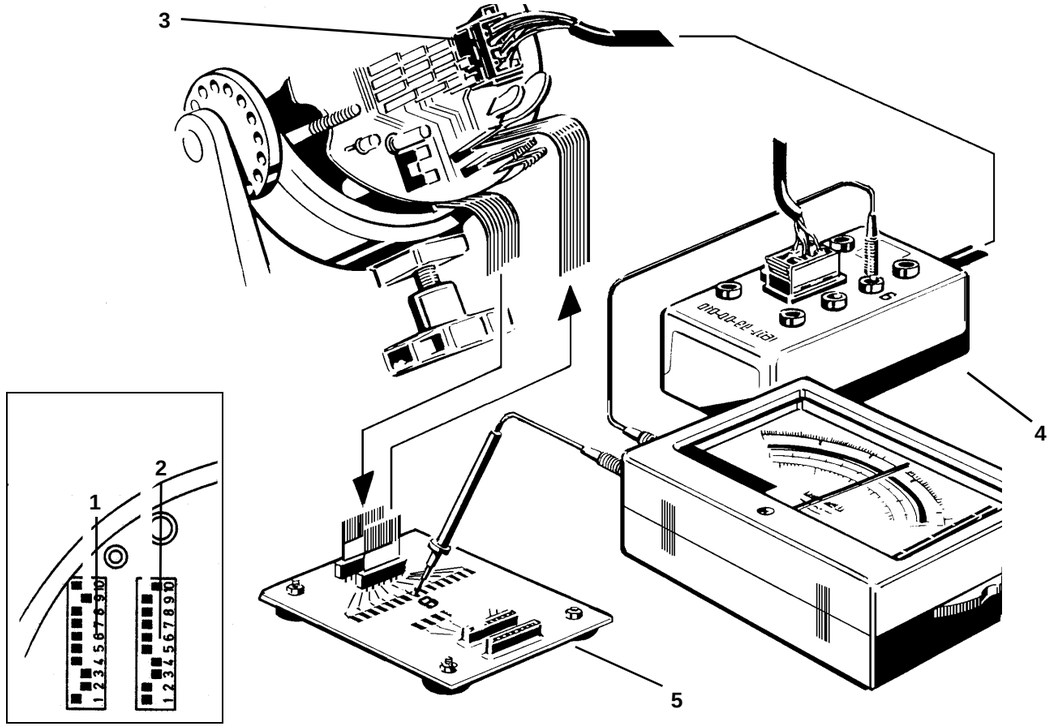


Fig. 7-2 Measuring adapter for flat cable and test adapter

1 Speed coding switch
2 RPM coding switch
3 Connector not coded
4 Test adapter
5 Flat cable measuring adapter

	a						b	c	d
				Component 1 voltage check			Troubleshooting		
1	**Error**	**Component 1**	**Component 2**	**Measuring point colour**	**2 V unit v = 0 km/h v = 60 km/h**	**24 V unit v = 0 km/h v = 60 km/h**	**Component 1**	**Resistance check Visual check Component 1 Component 2**	**Troubleshooting Component 2**
2	Clockwork mechanism defective	v board M					❹	❶ ❷	❹
			Quartz electronics K	Flat cable 23+, 24+	1.5 V ... 9.5 V		Faulty measuring values, replace v board.	Connect measuring device between the two coil connections, (MP1, MP2 and. 23, 24). Measuring value: 1.5...2k Ω	Faulty measuring value. Replace clockwork mechanism.
etc.	Illumination correct	v board M					❹	❶ ❷ Check lamp holder and contact.	❹
			Illumination J	Flat cable 25 +	12 V	24 V		❻ (on lamp holder) 24 V unit: 25 W (fitted) 52 W (removed) 12 V unit: 10 W (fitted)12 W (removed)	Faulty measuring value. Replace lamp; measuring value correct. Replace flat cable.

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7.5 "Basic" wiring diagram and fault analysis

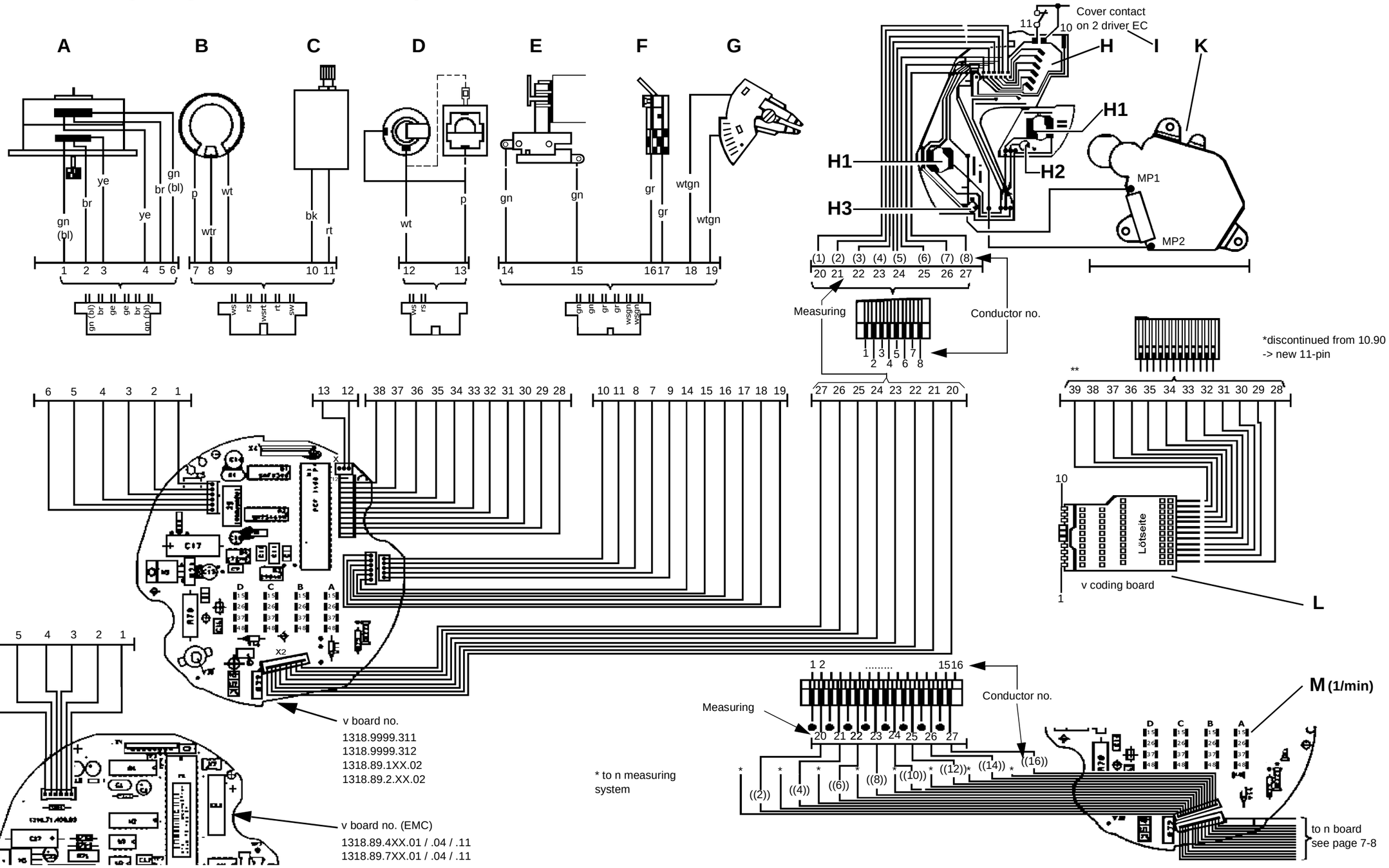

Fig. 7-3 "Basic" wiring diagram

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Error	Component 1	Component 2	Component 1 voltage check: Measuring point colour	Conductor no. ()	12 V unit: v = 0 km/h	12 V unit: v = 60 km/h	24 V unit: v = 0 km/h	24 V unit: v = 60 km/h	Troubleshooting Component 1	Resistance check / Visual check	Component 2 / Component 1	Troubleshooting Component 2
Clockwork mechanism defective	M / M1 v board				❶ ❷				❹	❶ ❷		❹
		K Clockwork mechanism	Flat cable 23 + 24 +	(4) ((8)) (5) ((10))	1.5 V ...>9.5 V imp		1.5 V ...>9.5 V imp		❺	❻ Connect measuring device between the two coil connections, (MP1, MP2 or 23, 24). Measuring value: 1.5...2 kΩ (4) (5) or ((8)) ((!0))		Faulty measuring value. Replace clockwork mechanism or flat cable.
Illumination defective	M / M1 v board				❶ ❷				❹	❶ ❷ Check lamp holder and contact.		❹
		H 1 Illumination	Flat cable 25 + 22 -	(6) ((12)) (3) ((6))	12 V		24 V		❺	❻ (on lamp holder) 24 V unit: 25 Ω (fitted) 52 Ω (removed) 12 V unit: 10 Ω (fitted) 12 Ω (removed)		Faulty measuring value Replace lamp. Measuring value correct, replace flat cable.
H2 warning LED defective	M / M1 v board				❶ ❷				❹	❶ ❷		❹
		H Lamp plate	Flat cable 27 +	(8) ((16))	0 V	11 V	0 V	13.5 V	❺	see component 2 troubleshooting		Faulty measuring value. Check contact carrier or replace LED.
		G contact carrier	wtgn 19 +		0 V	11 V	0 V	23.5 V	❹			
			wtgn 18 +		11 V		23.5 V		❺			
H3 warning LED defective	M / M1 v board	H Lamp plate ☒	Flat cable 26 +	(7) ((14))	Cover open		8 V	❾	❺			Also make a note of components A, E, F. ❼ Contact set
		F1 ☒ F2	Flat cable 21 - 26 +	(2) ((4)) (7) ((14))	Cover open Cover closed		8 V 0 V	❾ ❽	❹ ❺	see component 2 troubleshooting		
		I Cover contac ☒ F2	Flat cable 20 +	(1) ((2))			8 V 0 V	❾ ❽	❹ ❺	see component 2 troubleshooting		❼ I cover contact Lamp plate Flat cable
		I Cover contact	11 + cover open!		Cover open		8 V			❻ Connect measuring device between points 10 and 11. Tachograph chart inserted: 0 Ω Tachograph chart not inserted: ∞ Ω		❼
		H Lamp plate ☒ F2	10 +		F2 chart not inserted F2 chart inserted		8 V 0 V		❹			
Faulty speed display	M / M1 v board				❶ ❷				❹	❶ ❷ ❸		❹
		C v DC motor	bk 10 + r 11 +		0 V	2.7 ... 3.4V	0 V	2.7 ... 3.4V	❺	❻ Remove connector. Measuring value between wires r and bk: 50 Ω (+ 12 %) From 05.97 30 Ω		Faulty measuring value. Replace DC motor.
		B Potentiometer Speed	p 7 +		2.3 V				❺	❻ Remove connector. Measuring value between wires p and wt: about 200 Ω - 5 kΩ The resistance value must increase or decrease steadily when turning the pointer coupling slowly.		Faulty measuring value Replace frame and integral unit.
			wtr 8 +		5 V	4.3 V	5.7 V	4.3 V				
			wt 9 +		5.7 V							
		D I/O socket			see component 2					❻ Remove connector. Plug jack plug into test socket. Measuring value between pink wire and jack plug front part 0 Ω. Measuring value between white wire and jack plug back part Ω.		❼
		L Coding switch			see component 2					❻ Measuring device negative pole at point 28. Measuring value between points 29 and 38 if switch set to "ON": 0 Ω. Measuring value if switch set to "OFF": > 0.5 kΩ.		❼
Faulty distance recording Faulty WT recording H3 warning LED flashes	M / M1 v board				❶ ❷				❹			
		A WT motor Knobs set to ⊢⊢	ye 3 + br 2 + br 5 + ye 4 +		11.2 V	6 V	23 V	12.2 V	❺	❻ Remove connector. Measuring value between points 1 and 2 or 3 and measuring value between points 6 and 4 or 5: 150 Ω or 180 Ω (with 12 V units and STB; not µP) 700 Ω (with 24 V units)		❼ Lug missing / loose
			gn (bl) 1 + gn (bl) 6 +		11.2 V (bl)		23.3 V (gn)					
Voltage control function defective	M / M1 v board				❶ ❷				❹	❶ ❷		❹
		E Contact set	gn 14 + gn 15 +		Cover open		8 V	❿	❺	❻ Remove connector. Connect measuring device between points 14 and 15 (gn wire). Measuring value with cover closed: ❽ : Ω / ❾ 0 Ω		Faulty measuring value. Adjust or replace contact set.
			gn 14 +		Cover closed		0.2 V		❹			
		F Carriage contact	gr 16 + gr 17 +		0 km/h 8 V		0 km/h 8 V	❿	❺	see component 2 troubleshooting		Faulty measuring value. Adjust or replace carriage contact. Measuring value correct, replace v board.
			gr 16 +			0 V (v max.)		0 V (v max.)	❹			

Apply a 0 V potential to A6 tab connector for the measuring device.

\+ = Connect measuring device's positive cable. Measuring tolerance: ± 10 %

Measuring device: Multimeter –accuracy class 1.5 (>30.000 Ω /V)

⊓ = horizontal ⊥ = vertical

❶ = Visually check mechanical parts.
❷ = Visually check electrical cables, components, soldered connections, conductors and plug contacts.
❸ = Check gear engagement and that the gears from the DC motor to the potentiometer are running freely.
❹ = If defective, check or adjust the relevant component.
❺ = If defective, replace component 1 part.
❻ = Check ohmic resistance.
❼ = If defective, replace component 2 part.
❽ = Tachograph chart(s) inserted
❾ = Cover closed and tachograph charts missing
❿ = Cables may be interchanged.
( ) = 8 pin flat cable
(( )) = 16 pin flat cable

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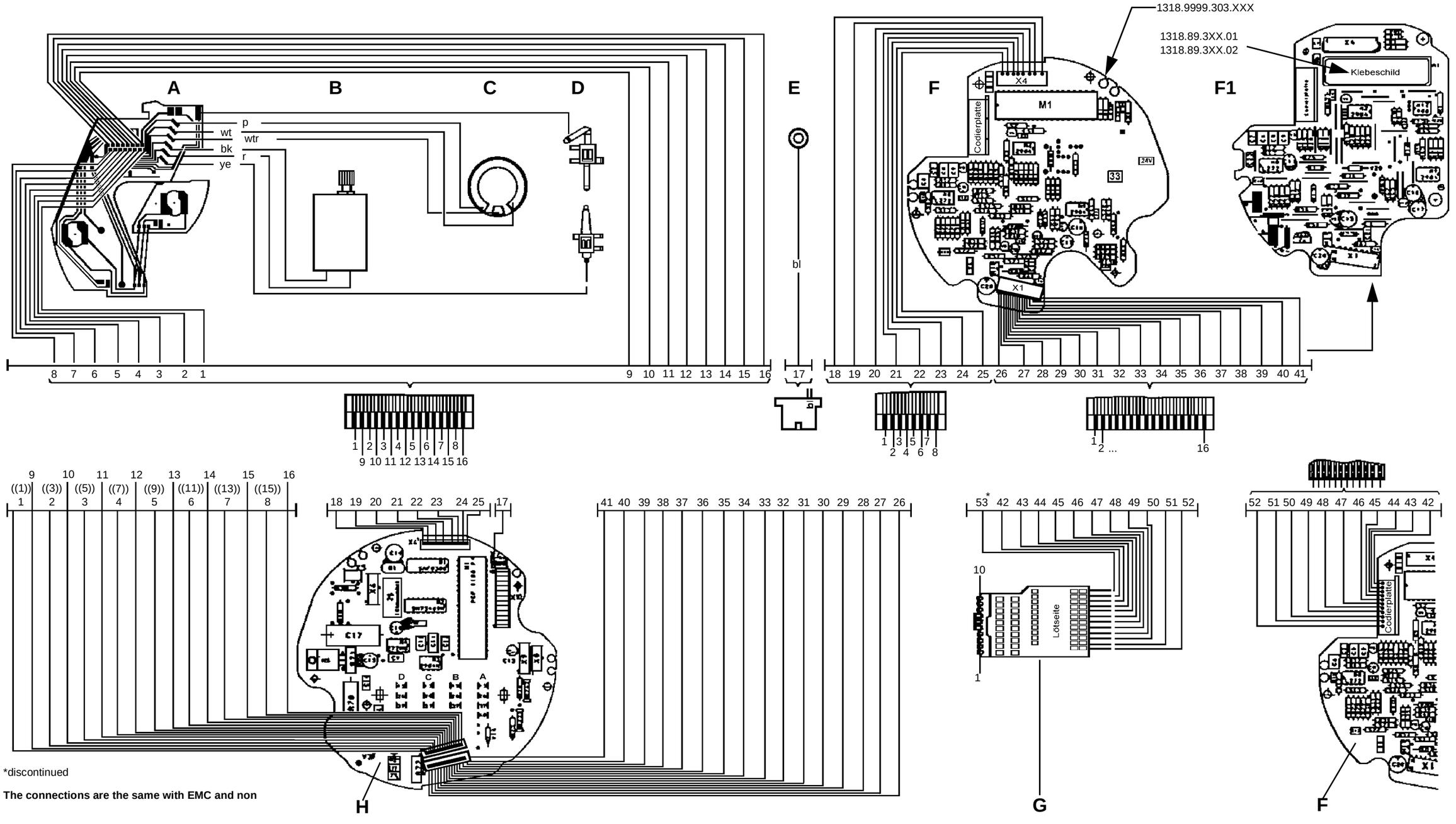
7.6 Wiring diagram and "RPM" fault analysis



*discontinued

The connections are the same with EMC and non

Fig. 7-4 "RPM" wiring diagram

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Error	Component 1	Component 2	Component 1 voltage check: Measuring point colour	Conductor no. ()	12 V unit: n= 0 rev/min	12 V unit: n= 2000 rev/min	24 V unit: n= 0 rev/min	24 V unit: n= 2000 rev/min	Troubleshooting Component 1	Resistance check Visual check	Component 2 Component 2	Troubleshooting Component 2
Faulty RPM display	H v board F / F1 n board				❶ ❷					❶ ❷		❹
		Flat cable from H v board to F n board	Flat cable 118 ... 25 26 ... 41		see component 2				❹	❻ Measuring value between v board and n board: 0 Ω ❼		❾ Faulty measuring value. Replace flat cable, check socket connector contacts on v and n boards.
	F / F1 n board	B DC motor RPM	Flat cable r 5 + bk 4 +	((9)) ((7))	0 V	3.4 ...4.2 V	0 V	3.4 ...4.2 V	❺	❻ Measuring value between points 4 and 5 (flat cable): ❼ 50 Ω ((7)) ((9)) From 05.97: 30 Ω		❽ Faulty measuring value. Unsolder r and bk wires from lamp plate A and repeat resistance measurement.
		C Potentiometer Resistor unit RPM	Flat cable p 1 +	((1))	5.4 V		5 V ..... 5.8 V EMC/ASIC µP		❺	❻ Remove flat cable from v board. Measuring value between points 1 and 2 (flat cable): 5 kΩ ((1)) ((3))		❽ ❾ Faulty measuring value. Unsolder p, wt and wtr wires from lamp plate and repeat resistance measurement.
			wtr 3 +	((5))	5.3 V	4.6 V	5.5 V	4.8 V / 4 V EMC		❼ Measuring value between ((3)) and ((5)) wires: 600 Ω ... 5 kΩ. ❻ The resistance value must increase and decrease steadily when adjusting the RPM stylus lever slowly.		
			wt 2 +	((3))	3.8 V		4.1 V / 2.8 V EMC					
		Flat cable from H v board to A lamp plate	Flat cable 1 ... 16		see component 2					❽ Measuring value between v board and lamp plate: 0 Ω ❻ ❼		Faulty measuring value. Replace flat cable.
		(Socket connector)			❶ ❷				❺			
	F / F1 n board	G Coding switch			see component 2					❽ Measuring device negative pole at point 52 (underside of n board). ❻ Measuring value between points 42 and 52 if switch set to "ON": 0 Ω Measuring value if switch set to "OFF": >1.5 Ω.		Faulty measuring value. Replace n board.
	H v board	E n test socket	bl 17							❻ Measuring value between test socket and v board: 0 Ω.		Faulty measuring value. Replace cable.
External n warning contact defective	H v board				❶ ❷					❶ ❷		❹
		D n warning contact	Flat cable 7 +	((13))	0 V	12 V	0 V	24 V	❹ ❺			❽ ❾ Faulty measuring value. Unsolder ye wire from lamp plate. Measuring value on ye wire and point 7 ((13)): not switched: :Ω switched: 0 Ω
			to connector output C8		0 V	12 V	0 V	24 V	❹ ❺			
			ye 6 +	((11))	12 V		24 V		❹ ❺			

Apply a 0 V potential to A6 tab connector for the measuring device.

+ = Connect measuring device's positive cable. Measuring tolerance: ± 10 %

Measuring device: Multimeter –accuracy class 1.5 (>30.000 Ω /V)

❶ = Visually check mechanical parts.
❷ = Visually check electrical cables, components, soldered connections, conductors and plug contacts.
❸ = Check gear engagement and that the gears from the DC motor to the potentiometer are running freely.
❹ = If defective, check, adjust or replace the relevant component.
❺ = If defective, replace component 1 part.
❻ = Measure ohmic resistance.
❼ = Remove flat cable.
❽ = Remove unit.
❾ = If defective, replace component 2 part.
(( )) Conductor no., 16-pin flat cable

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7.7 "Basic" wiring diagram and fault analysis - µP v board

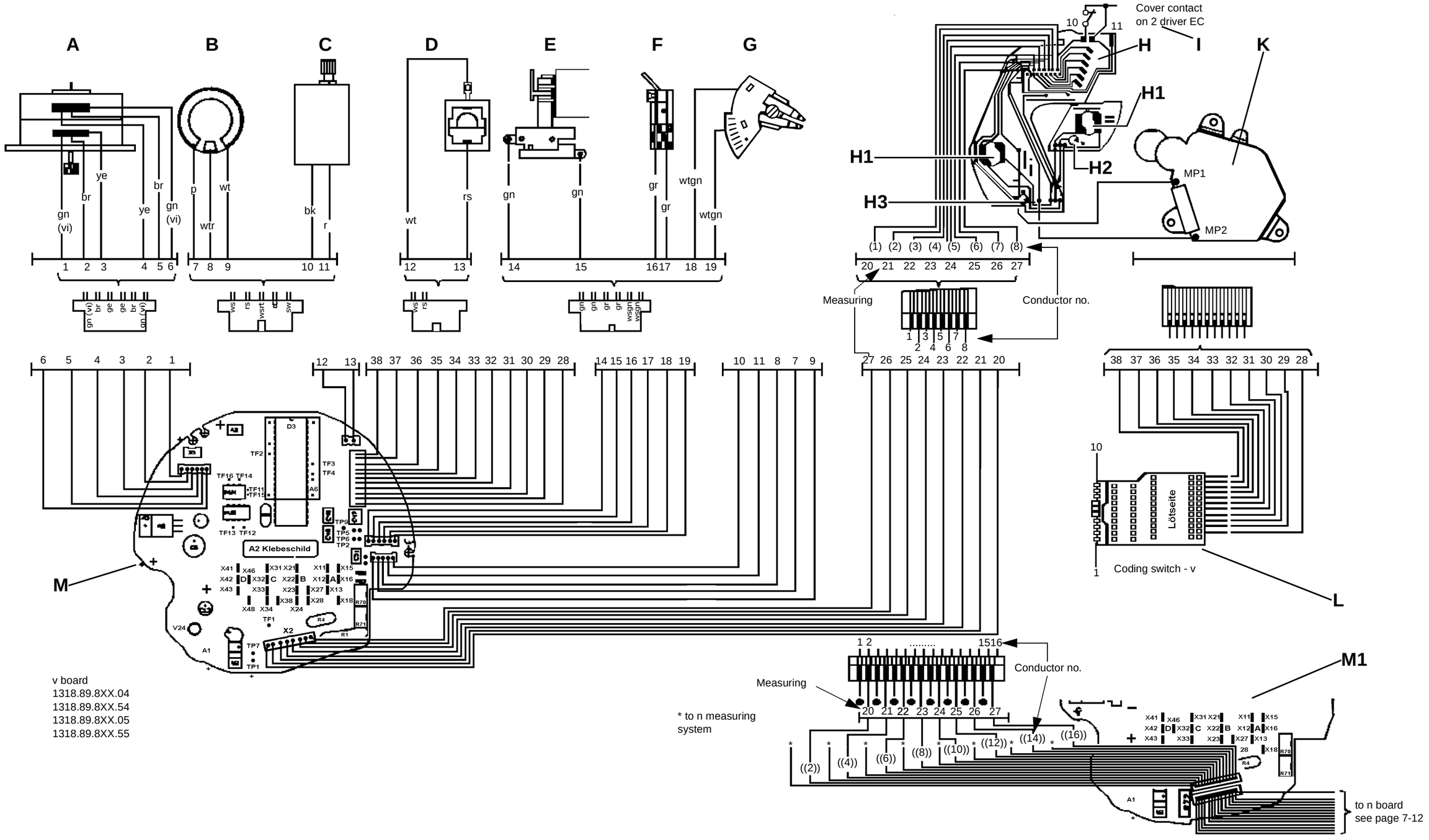

Fig. 7-5 "Basic" wiring diagram and fault analysis - microprocessor v board (µP)

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7.8 "RPM" wiring diagram and fault analysis - µP n board

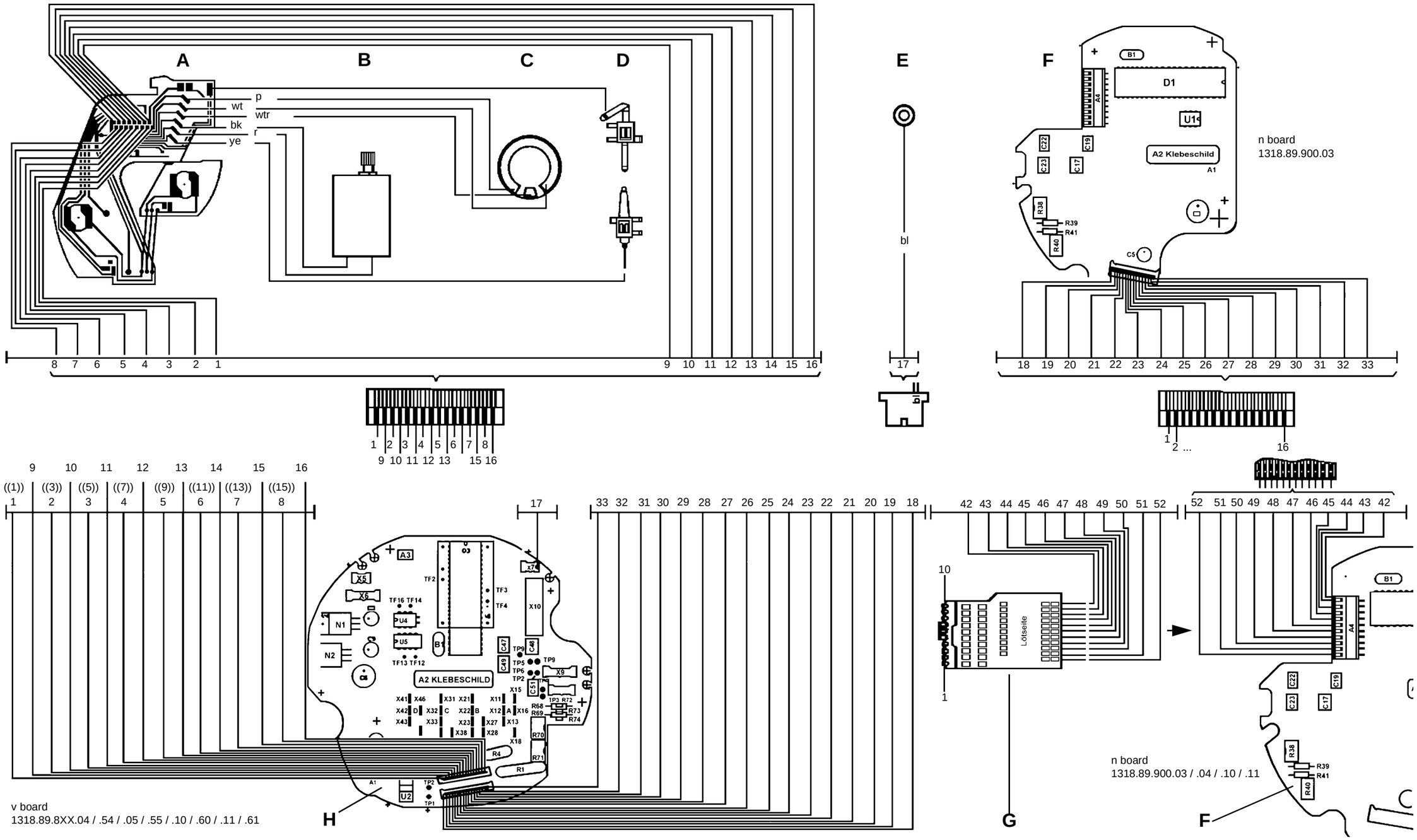

Fig. 7-6 "RPM" wiring diagram - microprocessor n board

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Error	Component 1	Component 2	Component 1 voltage check: Measuring point colour	Conductor no. ()	12 V unit: n= 0 rev/min	12 V unit: n= 2000 rev/min	24 V unit: v = 0 km/h	24 V unit: n= 2000 rev/min	Troubleshooting Component 1	Resistance check Visual check		Component 2 Component 2	Troubleshooting Component 2
Faulty RPM display	H v board F n board				❶ ❷					❶ ❷			❹
		Flat cable from H v board to F n board	Flat cable 18 ... 33		see component 2				❹	❻	Measuring value between v board and n board: 0 Ω		❾ Faulty measuring value. Replace flat cable, check socket connector contacts on v and n boards.
	F n board	B DC motor RPM	Flat cable r 5 + bk 4 +	((9)) ((7))	0 V	2.3 ... 3.2 V	0 V	2.3 ... 3.2 V	❺ ❹	❻ ❼	Measuring value between points 4 and 5 (flat cable): 50 Ω ((7)) ((9))		❽ Faulty measuring value. Unsolder r and bk wire from lamp plate A and repeat resistance measurement.
		C Potentiometer Resistor RPM	Flat cable p 1 +	((1))	5.4 V		5 ... 6.2 V		❺	❻	Remove flat cable from v board. Measuring value between points 1 and 2 (flat cable): 5 kΩ / ((1)) ((3))		❽ ❾ Faulty measuring value. Unsolder p, wt and wtr wires from lamp plate A and repeat resistance measurement.
			wsrt 3 +	((5))	5.3 V	4.6 V	5.5 V	4 ... 4.8 V	❹	❼	Measuring value between ((3)) and ((5)) wires: 600 Ω ... 5 kΩ.		
			wt 2 +	((3))	3.8 V		2.8 ... 4.1 V			❻	The resistance value must increase and decrease steadily when adjusting the RPM stylus lever slowly.		
		Flat cable from H v board to A lamp plate	Flat cable 1 ... 16		see component 2					❽ ❼ ❻	Measuring value between v board and lamp plate: 0 Ω		Faulty measuring value. Replace n board.
		(Socket connector)			❶ ❷				❺				
	F n board	G Coding switch			see component 2					❽ ❻	Measuring device's negative pole to point 52 (underside of n board. Measuring value between points 42 and 52 if switch set to "ON": 0 Ω. Measuring value if switch set to "OFF": > 1.5 kΩ		Faulty measuring value. Replace n board.
	H v board	E n test socket	bl 17							❻	Measuring value between test socket and v board 0Ω.		Faulty measuring value. Replace cable.
External n warning contact defective	H v board				❶ ❷					❶ ❷			❹
		D n warning contact	Flat cable 7 +	((13))	0 V	12 V	0 V	24 V (n max)	❹ ❺				❽ ❾ Faulty measuring value. Unsolder ye wire from lamp plate. Measuring value on ye wire and point 7 ((13)): not switched: :Ω switched: 0Ω
			to connector output C8		0 V	12 V	0 V	24 V (n max)	❹ ❺				
			ye 6 +	((11))	12 V		24 V		❹ ❺				

Apply a 0 V potential to A6 tab connector for the measuring device.

\+ = Connect measuring device's positive cable. Measuring tolerance: ± 10 %

Measuring device: Multimeter –accuracy class 1.5 (>30.000 Ω /V)

❶ = Visually check mechanical parts.

❷ = Visually check electrical cables, components, soldered connections, conductors and plug contacts.

❸ = Check gear engagement and that the gears from the DC motor to the potentiometer are running freely.

❹ = If defective, check, adjust or replace the relevant components.

❺ = If defective, replace component 1 part (n board).

❻ = Measure ohmic resistance.

❼ = Remove flat cable.

❽ = Remove unit.

❾ = If defective, replace component 2 part.

(( )) Conductor no., 16-pin flat cable

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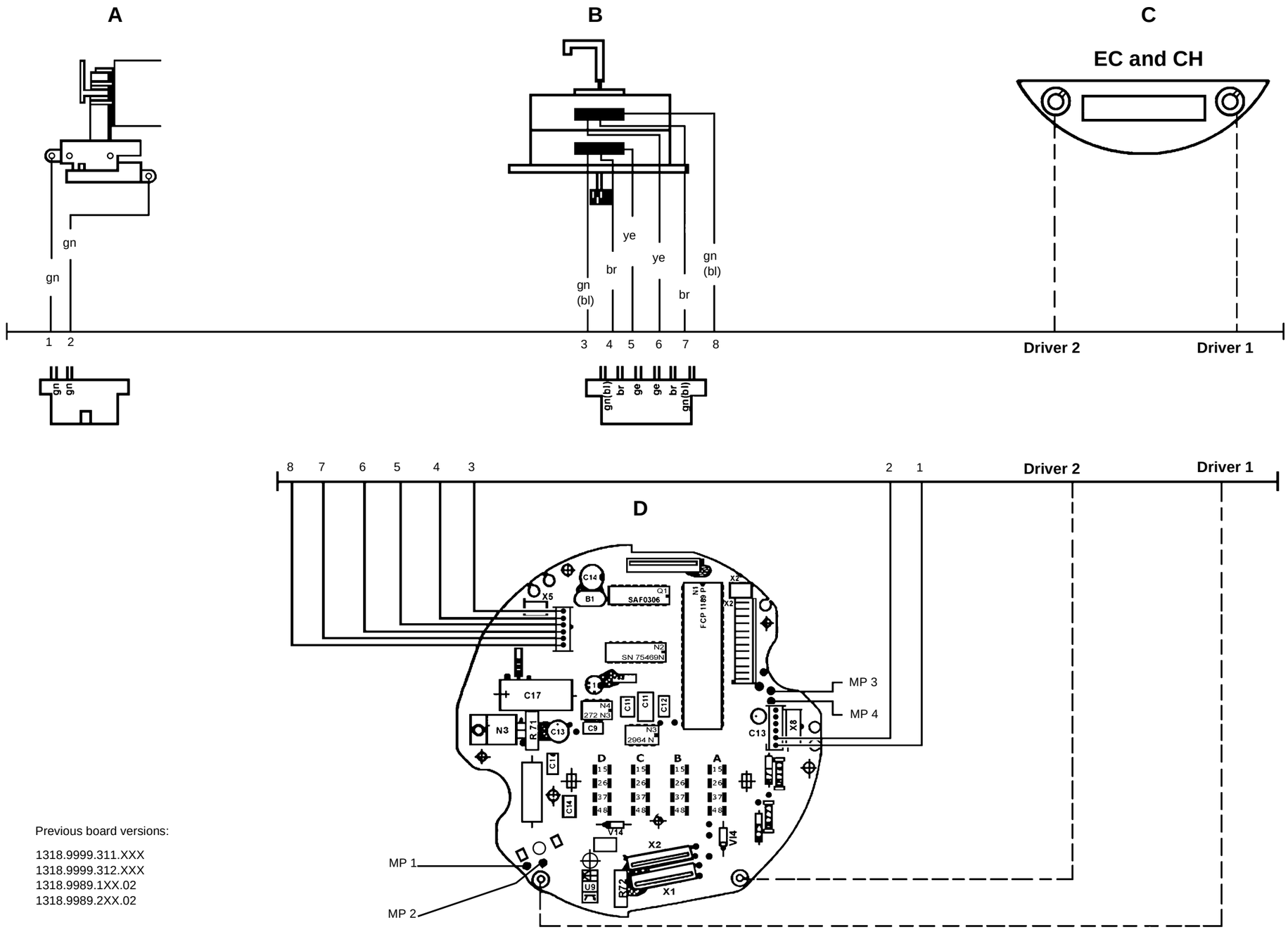
7.9 "EC units" and "CH" wiring diagram and fault analysis



Previous board versions:

1318.9999.311.XXX
1318.9999.312.XXX
1318.9989.1XX.02
1318.9989.2XX.02

Fig. 7-7 "EC units" and "CH" wiring diagram

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Error	Component 1	Component 2	Component 1 voltage check					Troubleshooting Component 1	Resistance check Component 2 / Visual check Component 1	Troubleshooting Component 2
			Measuring point colour		12 V unit n = 0 km/h	12 V unit n = 60 km/h	24 V unit n = 0 km/h / 24 V unit n = 60 km/h			
Warning LED flashes see page 7-7)	D v board	B Motor	ye + br + br + ye + gn (bl) + gn (bl) +		see page 7-7: "Faulty distance counter / WT recording"					
Warning LED lights up constantly. (See page 7-7)	D v board	A Warning contact set	gn 1		8 V			❹	❶ ❷	❹
			gn 2		Cover closed: 0.2 V ❽ Cover open: 8.0 V ❾			Faulty measuring value, replace v board.		Adjust or replace contact set.
Faulty working time recording With EMC and µP v boards these measurements need not be carried out (MP 1, MP 2, MP 3, MP 4 missing)	D v board	C Knobs (coupling between. v board and stop spring)		EC	CH			❹	❶ ❷	❹
			MP 1	⊢	⊢	7.4 V	7.4 V	Faulty measuring values, replace v board. ❺	Faulty measuring values. Check coupling between v board and stop spring. Correct if necessary. Repeat component 1 voltage check.	
			(Driver 1)	⊘	⚒	7.4 V	7.4 V			
				⚒	Ⓐ	0.6 V	0.6 V			
			MP 2	⊢	⊢	7.4 V	7.4 V			
			(Driver 1)	⊘	⚒	0.6 V	0.6 V			
				⚒	Ⓐ	7.4 V	7.4 V			
			MP3	⊢	⊢	7.4 V	7.4 V			
			(Driver 2)	⊘	⚒	7.4 V	7.4 V			
				⚒	Ⓐ	0.6 V	0.6 V			
			MP 4	⊢	⊢	7.4 V	7.4 V			
			(Driver 2)	⊘	⚒	0.6 V	0.6 V			
				⚒	Ⓐ	7.4 V	7.4 V			

A 0 V potential must be applied to the A6 tab connector for the measuring device.
+ = Connect measuring device's positive cable. Measuring tolerance: ± 10 %
Measuring device: Multimeter –accuracy class 1.5 (>30.000 Ω /V)

❶ = Visually check mechanical parts.
❷ = Visually check electrical cables, components, soldered connections, conductors and plug contacts.
❹ = If defective, check the relevant component.
❺ = If defective, replace v board.
❽ = Insert tachograph chart(s).
❾ = Cover closed and tachograph charts missing

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7.10 Additional equipment "A" and "B" wiring diagram and fault analysis

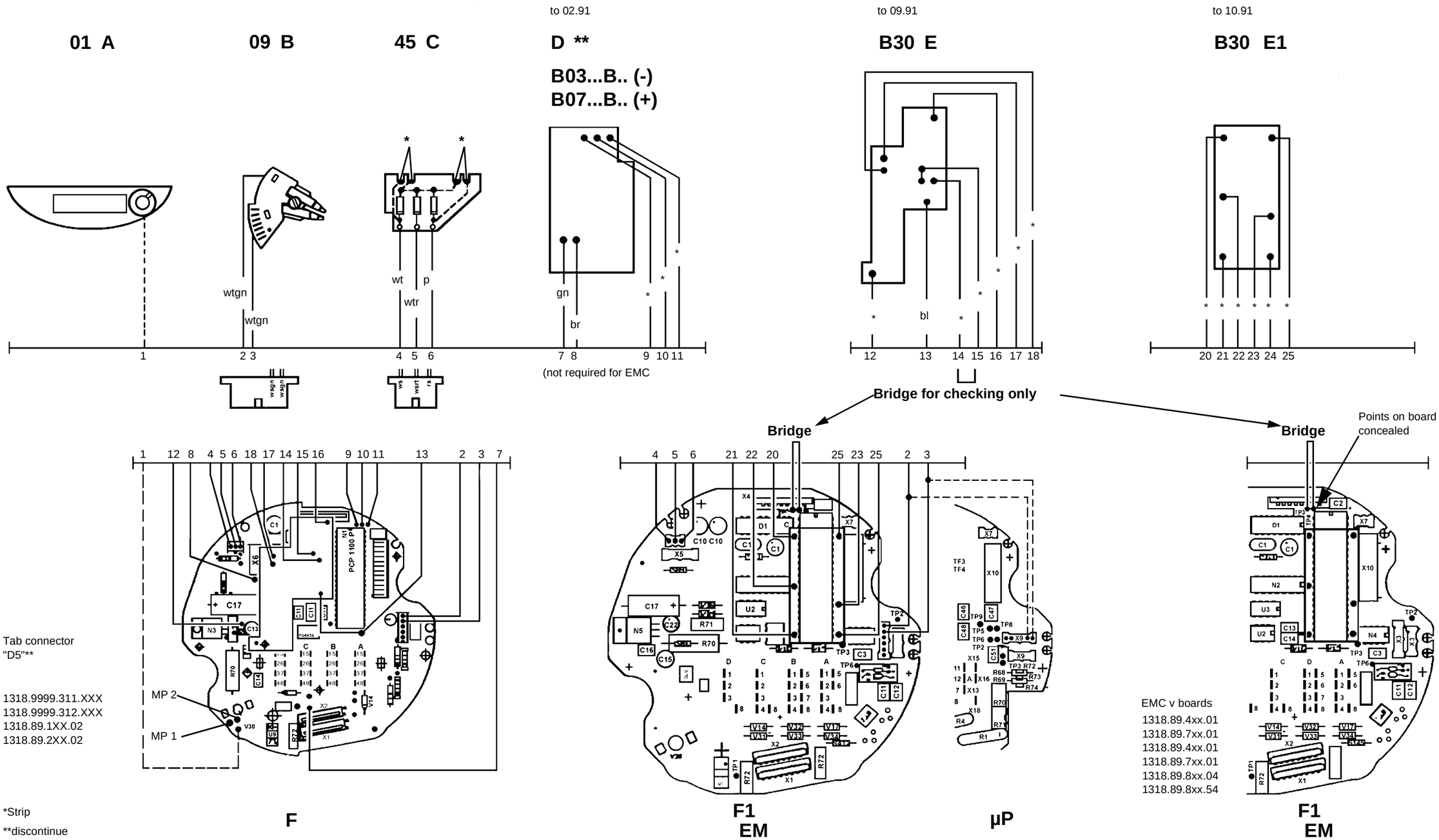

Fig. 7-8 Additional equipment "A" and "B" wiring diagram

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Error	Component 1	Component 2	Component 1 voltage check: Measuring point colour	Conductor no. ()	12 V unit: v = 0 km/h	12 V unit: v = 60 km/h	24 V unit: v = 0 km/h	24 V unit: v = 60 km/h	Troubleshooting Component 1	Resistance check Component 2 / Visual check Component 1	Troubleshooting Component 2
Clockwork mechanism defective	M / M1 v board				❶ ❷				❹	❶ ❷	❹
		K Clockwork mechanism	Flat cable 23 + 24 +	 (4) ((8)) (5) ((10))	0 V ...> 3.3 V imp		0 V ...> 3.3 V imp		❺	❻ Connect measuring device between the two coil connections, (MP1, MP2 or 23, 24). Measuring value: 1.5...2 kΩ (4) (5) or ((8)) ((10))	Faulty measuring value. Replace clockwork mechanism.
Illumination defective	M / M1 v board				❶ ❷				❹	❶ ❷ Check lamp holder and contact.	❹
		H 1 Illumination	Flat cable 25 + 22 -	 (6) ((12)) (3) ((6))	12 V		24 V		❺	❻ (on lamp holder) 24 V unit: 25Ω (fitted) 52 Ω (removed) 12 V unit: 10 Ω (fitted) 12 Ω (removed)	Faulty measuring value. Replace lamp. Measuring value correct. Replace flat cable.
H2 warning LED defective	M / M1 v board				❶ ❷				❹	❶ ❷	❹
		H Lamp plate	Flat cable 27 +	 (8) ((16))	0 V	11 V	0 V	13.5 V	❺	see component 2 troubleshooting	Faulty measuring value. Check contact carrier or replace LED.
		G Contact carrier	wtgn 19 +		0 V	11 V	0 V	23.5 V (v max.)	❹		
			wtgn 18 +		11 V		23.5 V		❺		
H3 warning LED defective	M / M1 v board	H Lamp plate ☒ F1 ☒ F2							❺		Also make a note of components A, E, F. ❼ contact set
			Flat cable 21 - 26 +	 (2) ((4)) (7) ((14))	Cover open Cover closed		8 V ❾ 0 V ❽		❹ ❺	see component 2 troubleshooting	
		I Cover contact ☒ F2	Flat cable 20 +	 (1) ((2))			7.2 ... 8 V ❾ 0 V ❽		❹ ❺	see component 2 troubleshooting	❼ Cover contact I, lamp plate flat cable
		I Cover contact H Lamp plate ☒ F2	11 + 10 +		8 V Chart not inserted Chart inserted		8 V 0 V		❹	❺ Connect measuring device between points 10 and 11. Tachograph chart inserted: 0 Ω Tachograph chart not inserted: : Ω	❼
Faulty speed display	M / M1 v board				❶ ❷				❹	❶ ❷ ❸	❹
		C v DC motor	bk 10 + r 11 +		0 V	2.7 ... 3.4V	0 V	2.7 ... 3.4V	❺	❻ Remove connector. Measuring value between wires r and bk: 50 Ω. (+ 12 %) From 05.97: 30 Ω	Faulty measuring value. Replace DC motor.
		B Potentiometer Speed	p 7 + wtr 8 + wt 9 +		2.3 V 5 V 5.7 V		4.3 V 5.7 V	4.3 V	❺	❻ Remove connector. Measuring value between p and wt wires: 5 kΩ . Measuring value between wt and wtr wires: 200 Ω - 5 kΩ The resistance value must increase and decrease steadily when turning the stylus coupling slowly.	Faulty measuring value. Replace frame and integral unit.
		D I/O socket			see component 2					❻ Remove connector. Plug jack plug into test socket. Measuring value between pink wire and jack plug front part: 0 Ω. Measuring value between white wire and jack plug back part: 0 Ω.	❼
		L Coding switch			see component 2					❻ Measuring device negative pole at point 28. Measuring value between points 29 and 38 if switch set to "ON": 0 Ω. Measuring value if switch set to "OFF": > 1.5 kΩ.	❼ Set 8000 imp/km again after this measurement.
Faulty distance recording Faulty WT recording H3 warning LED flashes.	M / M1 v board				❶ ❷				❹	❶ ❷	❹
		A WT motor Knobs set to ⊢⊢	ye 3 + br 2 + br 5 + ye 4 +		11.2 V	6 V	23 V	12.2 V	❺	❻ Remove connector. Measuring value between points 1 and 2 or 3 and measuring value between points 6 and 4 or 5: 150 Ω or 180 Ω (with 12 V units) 700 Ω (with 24 V units)	❼ Lug missing / loose
			gn (bl) 1 + gn (bl) 6 +		11.2 V (bl)		23.3 V (gn)				
Voltage control function defective	M / M1 v board				❶ ❷				❹	❶ ❷	❹
		E Contact set	gn 14 - * Cover gn 15 - * open		11.8 V		23.5 V ❿		❺	❻ Remove connector. Connect measuring device between points 14 and 15 (gn wire). Measuring value with cover closed: ❽ : Ω / ❾ 0 Ω	Faulty measuring value. Adjust or replace contact set.
			gn 14 - * closed		6.5 V		18 V		❹		
		F Carriage contact	gr 16 - * gr 17 - *		11.8 V		23.5 V	❿	❺	see component 2 troubleshooting	Faulty measuring value. Adjust or replace carriage contact.. Measuring value correct, replace v board.
			gr 16 - *			6.8 V (v max.)		18.5 V (v max.)	❹		

* Apply V potential on A1 tab connector for measuring device.
The 0 V measuring device potential must be applied to the A6 tab connector.
\+ = Connect measuring device's positive cable. Measuring tolerance: ± 10 %

Measuring device: Multimeter –accuracy class 1.5 (>30.000 Ω /V)

⊓ = horizontal ⊥ = vertical

❶ = Visually check mechanical parts.
❷ = Visually check electrical cables, components, soldered connections, conductors and plug contacts.
❸ = Check gear engagement and that the gears from the DC motor to the potentiometer are running freely.
❹ = If defective, check or adjust the relevant components.
❺ = If defective, replace component 1 part.
❻ = Check ohmic resistance.
❼ = If defective, replace component 2 part.
❽ = Tachograph chart(s) inserted
❾ = Cover closed and tachograph charts missing
❿ = Cables may be interchanged.
( ) = 8 pin flat cable
(( )) = 16 pin flat cable

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Error	Component 1	Component 2	Component 1 voltage check						Troubleshooting Component 1	Resistance check Visual check	Component 2 Component 2	Troubleshooting Component 2
			Measuring point colour	Conductor no. ()	12 V unit v = 0 km/h	12 V unit v = 60 km/h	24 V unit v = 0 km/h	24 V unit v = 60 km/h				
Driver change function defective [01]	H v board (this measurement is not needed with EMC v boards)	A knob (coupling between v board and stop spring)							❹	❶ ❷		❹
			MP1	1	7.4 V		7.4 V		Faulty measuring values. Replace v board.	Faulty measuring values. Check coupling between v board and stop spring. Correct if necessary. Repeat component 1 voltage check.		
				•	7.4 V		7.4 V					
				2	0.6 V		0.6 V					
			MP2	1	7.4 V		7.4 V					
				•	0.6 V		0.6 v					
				2	7.4 v		7.4 V					
External warning contact defective. [09]	F / F1 v board								❹	❶ ❷		❹
			wtgn 3 + wtgn 2 + Connector A8 +		11.5 V Switched: 11.5 V Not switched: 0 V		23.5 V Switched: 23,5 V					Faulty measuring value. Adjust or replace contact carrier.
Pulse output: 4 imp/m defective [09] **Pulse outpu:t faulty v pulse**	F / F1 v board								❹	❶ ❷		❹
			Connector B8 +		0 V	3.2 V	0 V	3.2 V	Faulty measuring values. Replace v board.			
			Connector B7 + Connector D3 +		0 V 0 V	1.8 V 1.8 V	0 V 0 V	1.8 V 1.8 V	Faulty measuring values. Replace v board.			
Faulty stop signal [09]	F / F1 v board								❹	❶ ❷		❹
			Connector D8 +		0 V *	6.3 V	0 V *	6.3 V	Faulty measuring values. Replace v board.			
Two level additional stylus defective [45]	F / F1 v board	C diode plate							❹	❶ ❷		❹
					+ U_B to D1 tab connector	+ U_B to D1 and D2 tab connectors	+ U_B to D1 tab connector	+ U_B to D1 and D2 tab connectors	Faulty measuring values. Replace v board.	Measuring values between wt and wtr wires: 12 V = 105 Ω. 24 V = 470 Ω Measuring values between p and wtr wires: 12 V = 105 Ω 24 V = 470 Ω		
			wt 4 wtr 5 p 6		0.8 V 0 V 12 V	12 V 0 V 12 v	0.8 V 0 V 24 V	24 V 0 V 24 V				
Automatic power off function (after 36 hrs) defective [B 30]	F v board	E WT power off unit							❹	❶ ❷		❹
										Set knobs to ⊘. Bridge points 14 and 15 on E board. Use an insulated wire, length 20 cm, tinned ends, cross-section 0.75 mm^2 for this. After about 7 seconds the motor (distance and time group) must stop.		Function not working properly. Replace WT power off unit.
Faulty speed display [B03 ... B .. (-) switching] **[B07 ... B .. (+) switching]**	F v board	D Two speed axle plate			(-) switching	(+) switching	(-) switching	(+) switching	❹ Faulty measuring values. Check gear ratios. Faulty measuring values. Replace v board.	❶ ❷		❹ If defective, replace component 2 part.
					D5 not used / 0 V	D5 not used / U_B	D5 not used / 0 V	D5 not used / U_B				
			gn 7		11.5 V	11.5 V	23.2 V	23.2 V				
			10 +		3.3 V		4.4 V					

A 0 V potential must be applied to the A6 tab connector for the measuring device.

❶ = Visually check mechanical parts.

❹ = If defective, check the relevant component.

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Section 8 Lubrication charts

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8 Contents and unit assignment

Contents/Unit assignment		Fig.	EC Tacho-graphs				NEC Tacho-graphs			NEC Tachographs CH			Page
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8	**Lubrication charts**												
8.1	Lubricants list – Greases and oils		o	o	o	o	o	o	o	o	o	o	8-3
8.2	Distance counter	Fig. 8-1	o	o	o	o	o	o	o	o	o	o	8-5
8.3	n frame: Studs, sockets, styluses	Fig. 8-2	-	o	o	-	-	o	-	-	o	-	8-5
8.4	Back of frame: Stop spring catch	Fig. 8-3	o	o	o	o	o	o	o	o	o	o	8-6
8.5	Frame: v measuring system	Fig. 8-4	o	o	o	o	o	o	o	o	o	o	8-6
8.6	Front of frame: Styluses, carriage guide	Fig. 8-5	o	o	o	o	o	o	o	o	o	o	8-7
8.7	Frame studs and transmission elements	Fig. 8-6	o	o	o	o	o	o	o	o	o	o	8-8
8.8	Frame: Driver 2 lever	Fig. 8-7	-	o	o	-	-	-	-	-	-	-	8-9
8.9	Frame – CH version: Styluses	Fig. 8-8	-	-	-	-	-	-	-	o	o	o	8-9
8.10	Frame – ZuE "45": Stylus	Fig. 8-9	o	o	o	o	o	o	o	-	-	-	8-10

Key

- \- **not available**
- o **optional**

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8.1 Lubricants list – Greases and oils

Symbol Symbol Symbole	**Bedeutung Explanation of symbols Explication des symboles**
A =	• Nur leichten Ölfilm auftragen. • Apply a thin film of oil only. N'appliquer qu'un léger film d'huile.
B =	• Mischen im Verhältnis 7 Teile Benzin oder Kristallöl und 3 Teile Öl. • Mix 7 parts of petrol or crystal oil and 3 parts of oil. • Rapport de mélange 7 parts d'essence ou d'huile cristal et 3 parts d'huile.
G =	• Mit getränktem Lederlappen abreiben. • Wipe with an oil-soaked leather. • Frotter à l'aide d'un chiffon en cuir imbibé d' huile
⚠ =	• Diese Stellen dürfen nicht geschmiert werden. • Do not apply grease here. • Ne pas appliquer de la graisse sur les lieux marqués.

Symbol Symbol Symbole	*** Art der Verpackung Type of packaging Genre d'emballage Lieferbare Menge Quantity supplied Quantité livrable**	**Bestell-Nr. Order no. No. de commande Schlüssel-Nr. Code number No. de code**	**Fette/Grease/Graisses Bezeichnung Description Dénomination**
1	TU 400 g	KN06.5100.008	Renolit LZR

Symbol Symbol Symbole	*** Art der Verpackung Type of packaging Genre d'emballage Lieferbare Menge Quantity supplied Quantité livrable**	**Bestell-Nr. Order no. No. de commande Schlüssel-Nr. Code number No. de code**	**Öle/Oil/Huiles Bezeichnung Description Dénomination**
55	Fl 20 ml	KN06.5101.061	Uhrenöl 8031 Clock oil 8031 Huile spéciale pour m^{ts} d'horlogerie 8031
62	Fl 90 g	KN06.5101.152	Wik 700
64	Fl 10 ml	KN06.5101. 148	K7 132 MV

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Bestell-Beispiel

Bestell-Beispiel Ordering example Example de commande		
Menge Quantity Quantité	**Bestell-Nr. Order no. No. de commande**	**Bezeichnung Description Dénomination**
TU 900 g	KN06.5100.008	Beacon 2

* TU	=	Tube/Tube/Tube
D	=	Dose/Tin/Boîte
FL	=	Flasche/Bottle/Flacon
H	=	Hobbock/Container/Récipient

! Hinweis

Alle aufgeführten Schmiermittel sind bei uns im Werk geprüft worden. Sie entsprechen in ihren Eigenschaften und der Zusammensetzung den vielfachen Anforderungen, die an unsere Geräte gestellt werden. Wir müssen darauf bestehen, dass nur oben aufgeführte Schmiermittel verwendet werden. Sollten Ihnen von anderen Herstellern Schmiermittel angeboten werden, würden wir Sie bitten, diese zur Überprüfung an uns zu senden.

! Note

All lubricants listed have been tested at the factory. The qualities and mixtures chosen meet the various requirements our devices must fulfil. We therefore have to insist that only the lubricants listed above are used.
If you are offered lubricants from other manufacturers, please send them to us for testing.

! Remarque

Tous les lubrifiants indiqués ont été soumis à une vérification dans l'usine. En ce qui concerne leur qualitét et leur mélange ils correspondent aux exigences variées avec lesquelles nos instruments sont confrontés.
Nous devons insister à ce que seulement les lubrifiants mentionnés ci-dessus soient utilisés. Si des lubrifiants vous sont offerts par d'autres fabricants nous vous prions de nous les envoyer afin que nous puissions les vérifier.

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8.2 Distance counter

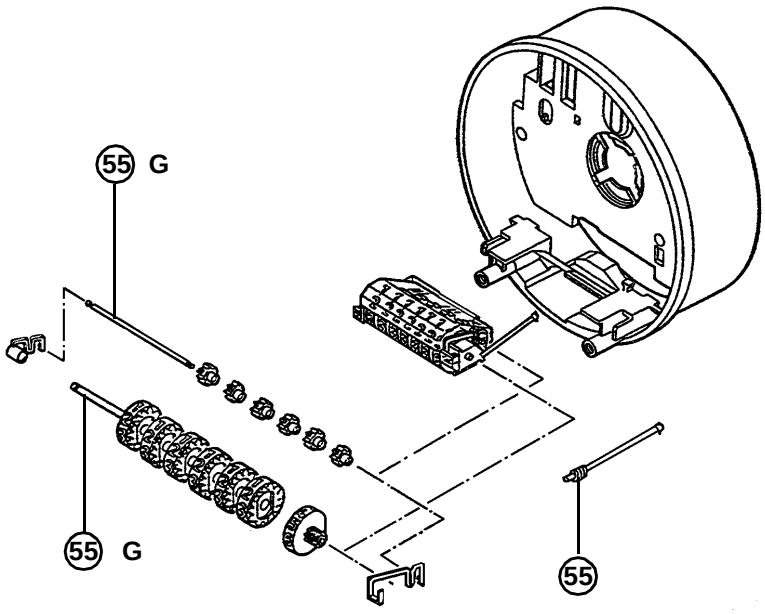

Fig. 8-1 Distance counter

8.3 n frame: Studs, sockets, styluses

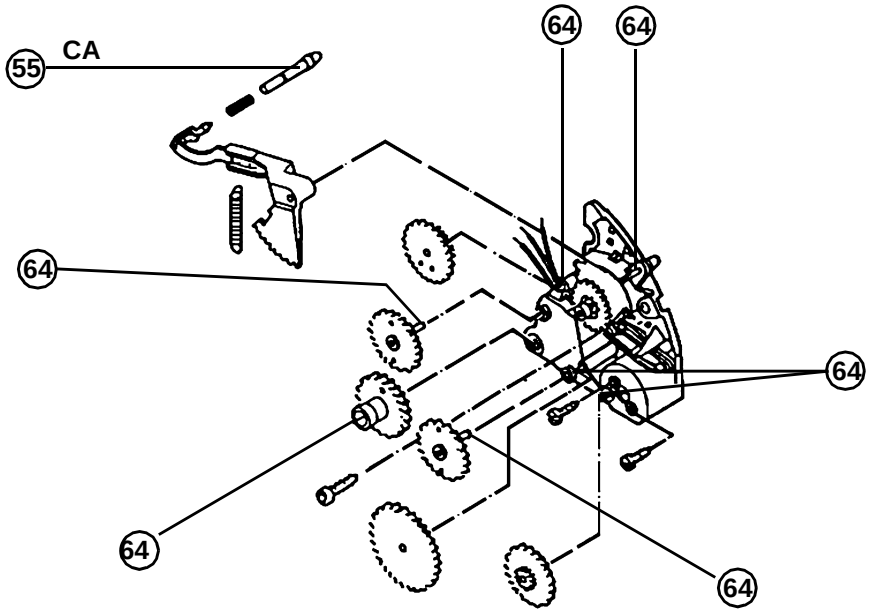

Fig. 8-2 n frame

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8.4 Back of frame: Stop spring catch

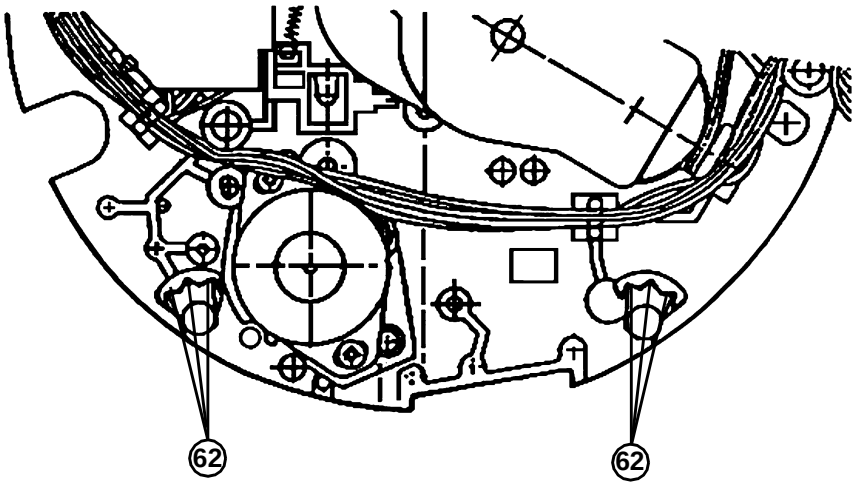

Fig. 8-3 Back of frame

8.5 Frame: v measuring system

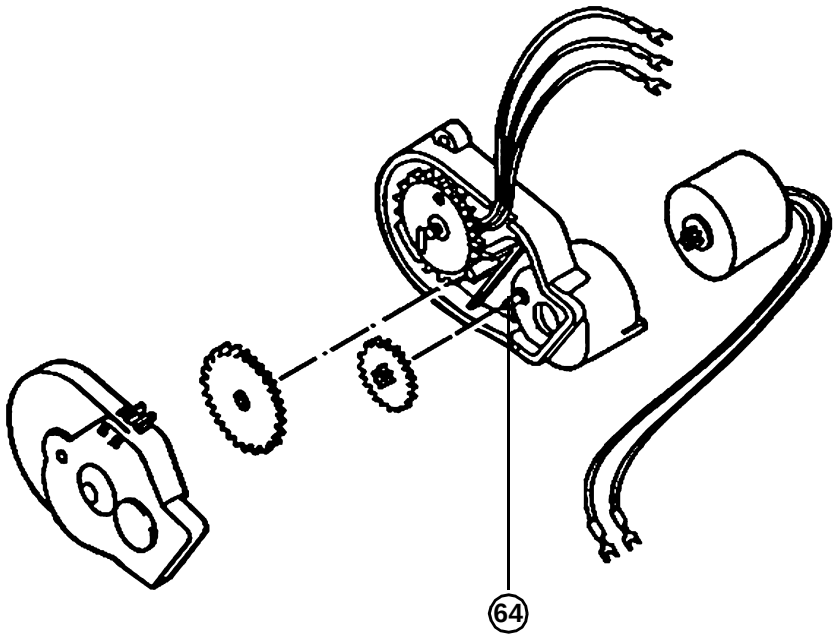

Fig. 8-4 Frame: v measuring system

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8.6 Front of frame: Styluses, carriage guide

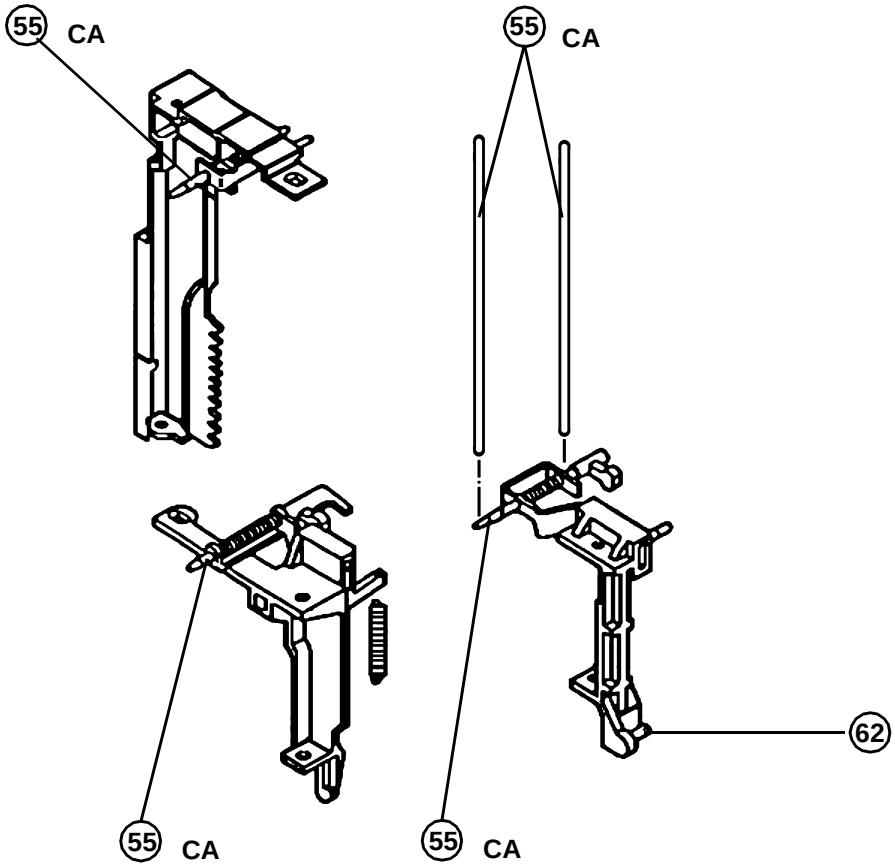

Fig. 8-5 Front of frame

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8.7 Frame studs and transmission elements

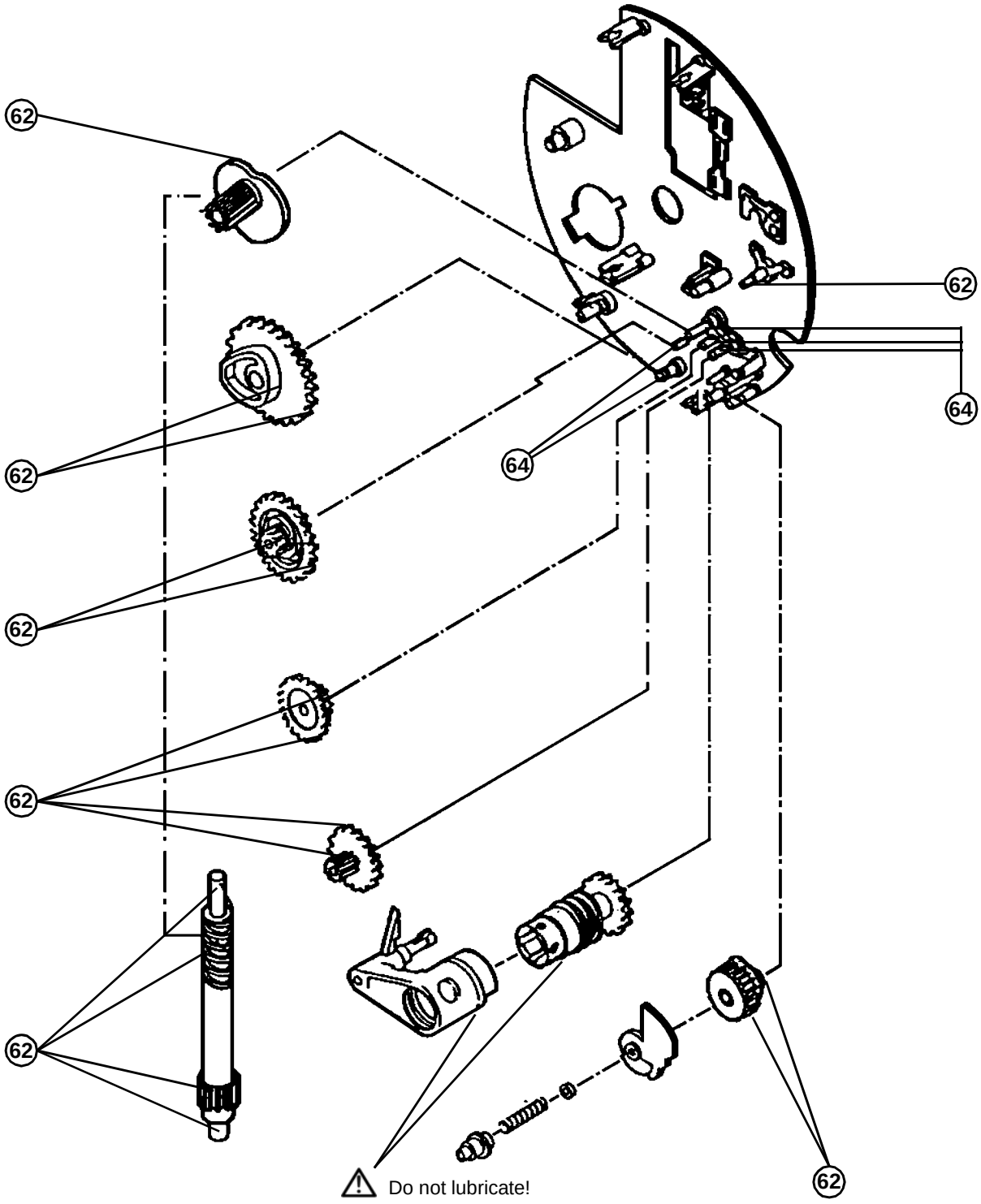

Fig. 8-6 Frame studs and transmission elements

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8.8 Frame: Driver 2 lever

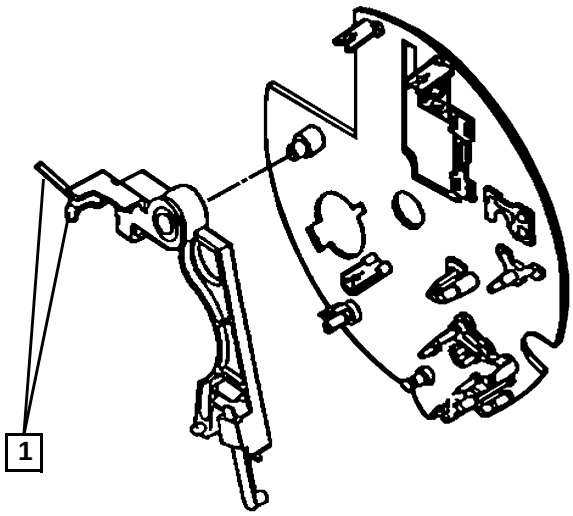

Fig. 8-7 Frame: Driver 2 lever

8.9 CH frame version: Styluses

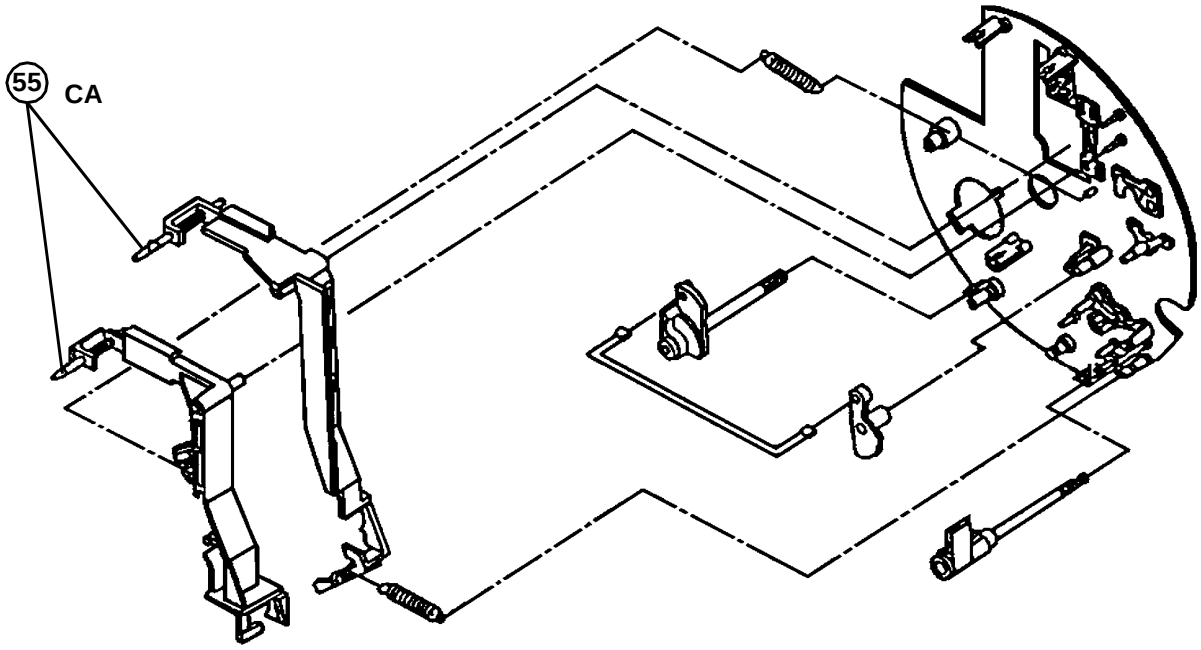

Fig. 8-8 CH frame version: Styluses

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8.10 ZuE "45" frame: Stylus

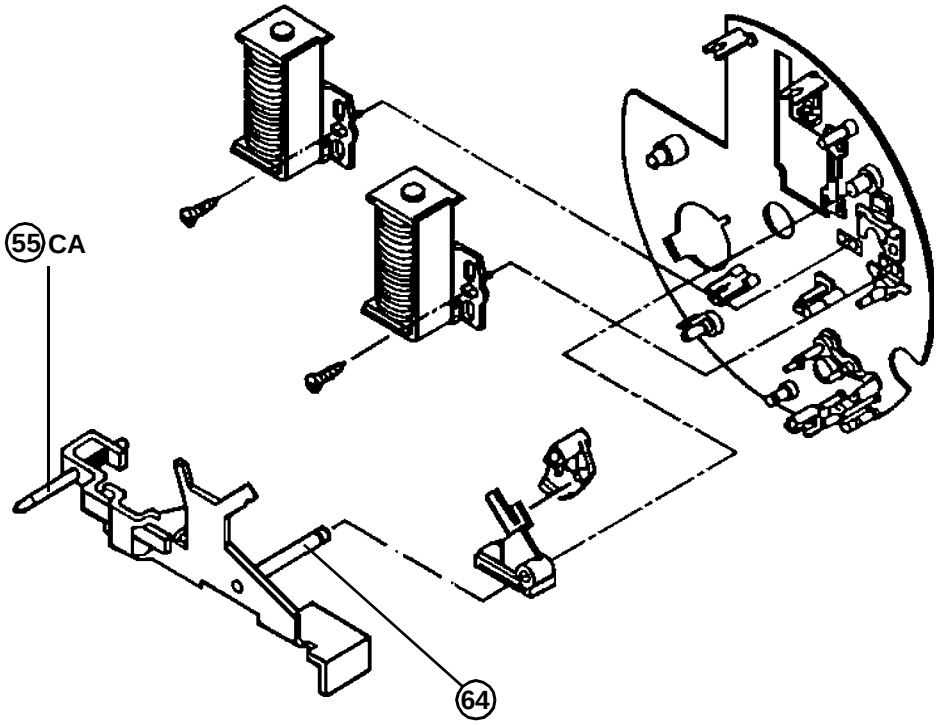

Fig. 8-9 ZuE "45" frame: Stylus

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